U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1341

Rev.ed. follows

MULE PRODUCTION

THE ABILITY of the mule to endure hardship and perform sterling service under adverse conditions has established him as a real asset in American agriculture.

The mule will give best service under favorable conditions of feeding and management.

Good, sound mares should be selected for breeding in order to be successful in producing high-grade mules. A very desirable "mule mare" is one having about one-fourth draft blood.

The most practical feeds to use for mules are those which are grown on the farm or plantation so far as they provide the essential nutrients for a balanced ration.

The general form and appearance of the mule should resemble closely that of a horse, and in judging mules the same general points of perfection should be looked for.

Mules vary in height from 12 hands to 17½ hands and in weight from 600 pounds to 1,600 pounds.

While the mule is essentially a draft animal, it is used widely for utility purposes, especially in the South. A smart, alert mule, with a long, free stride at the walk and a snappy, balanced trot is highly desired.

Washington, D. C. August, 1923

MULE PRODUCTION.[1]

By J. O. WILLIAMS, *Senior Animal Husbandman, Animal Husbandry Division, Bureau of Animal Industry.*

CONTENTS.

	Page.		Page.
Distribution of mules in the United States	1	Production of mules—Continued.	
Advantages of the mule as a work animal	2	Weaning the colt	11
Some peculiarities of the mule	2	The orphan foal	12
Production of mules	4	Spring or fall colts	13
Selecting the jack	4	Educating the colt	13
Care of the jack	5	Feeding and care of mules	13
Feeds for the jack	6	Judging mules	14
The brood mare	6	Market classes of mules	17
Breeding the mare	8	Draft mules	19
Care of the pregnant mare	9	Farm mules	19
Care of mare at foaling time	10	Sugar mules	27
Care of mare and foal	10	Cotton mules	27
		Mining mules	27

DISTRIBUTION OF MULES IN THE UNITED STATES.

THE importance and popularity of the mule as a work animal is attested by the greatly increased use of the animal in our farm operations. In 1910, the number of mules on farms and ranches was 4,209,769. The number on January 1, 1920, was 5,432,391, an increase, during the decade, of 1,222,622, or nearly 30 per cent. Of the 5,432,391 mules on farms in 1920, 3,172,797, or nearly three-fifths, are in the nine Cotton Belt States, which in the number of mules rank as follows:

Texas	845,932
Georgia	406,351
Oklahoma	336,635
Arkansas	322,677
Mississippi	308,216
Alabama	296,138
North Carolina	256,569
South Carolina	220,164
Louisiana	180,115
Total	3,172,797

The only States outside the Cotton Belt having more than 175,000 head of mules are Missouri, with 389,045, Tennessee 352,510, Kansas 243,332, and Kentucky 292,857. The total number of horses in the Cotton Belt States on January 1, 1920, was 2,855,257, or about 90 per cent as many horses as mules. The only Cotton Belt States having more horses than mules are Texas and Oklahoma.

[1] In the preparation of this bulletin the writer is indebted for helpful suggestions and assistance from G. A. Bell, horse-breeding expert in the Remount Service, War Department, and R. S. Whitfield, a former employee of the Animal Husbandry Division.

ADVANTAGES OF THE MULE AS A WORK ANIMAL.

The mule is a hardy work animal. While this humble creature responds to good treatment and gives best service under favorable conditions of feeding and management, it is his ability to endure hardship and to perform sterling service under adverse conditions that has established him so firmly in American agriculture. Those who are stanch supporters of the mule say that, in comparison with the horse, he will live longer, endure more work and hardship, require less attention and feed, is less liable to digestive disorders, lameness, and disease, is more easily handled in large numbers, is less irritable, and is more capable of performing work in the hands of a mediocre or poor horseman. Whether or not all these claims may be

FIG. 1.—A pair of farm mules.

substantiated, it is a fact that the mule is well established as a work animal in those sections where climatic conditions are most severe, feed less abundant, and horsemanship is not a prevailing art (Fig. 1).

SOME PECULIARITIES OF THE MULE.

The mule is an animal with possibly more eccentricities and undeniable virtues than any other domestic animal. One would naturally expect from his heritage a rather unusual temperament requiring the most thoughtful treatment. The difficulty is to know how to handle the mule in order to keep the desirable qualities of his maternal ancestry in the foreground and to keep subservient the latent donkey characteristics. To treat consistently a conglomeration of stubbornness and willingness, temper and sullenness, contentment and restlessness, slyness and docility, faithfulness and waywardness, with no knowledge of which virtue or vice is going to assert itself next, is

a problem which may well tax the qualities of the best horseman. Yet the virtues of the mule have been so evident in times of peace and war that many ardent horse lovers who have been prejudiced against him have come to admire the animal which has no "pride of ancestry or hope of posterity" (Fig. 2).

There are some peculiarities which belong to the mule alone. He does not like to be hurried, worried, or cuffed about; to try to force him to do things against his will is practically impossible and only makes matters worse. The mule must be understood and gently but firmly persuaded to do things out of the ordinary. He is naturally suspicious of everybody who comes around him, and it can be readily observed that he never takes his eye off a person near by, and when the ears begin to wag a little the person watched had better

FIG. 2.—Many mules find their way into the U. S. Army. Good, sound mules with quality are required. This illustration shows representative types of "lead" and "wheel" mules in Army service.

be on the lookout. There seems to be a code system of ear signaling among mules that they all understand. A mean mule can deftly handle his hind legs, and his forelegs are not to be ignored. He has been known to handle his "mits" in a clever fashion. The mule seems to have an uncanny way of detecting whether a person is going to treat him harshly or kindly, and his reception is usually in like manner, nor does he forget the person who inflicts harsh treatment.

There is a wrong and a right way to lead a mule. A man who looks at a mule and lugs at his head will never make any progress. The mule will not be pulled. He will usually follow quietly, however, if a man will walk away in the direction he desires to go. Neither can you "bully" mules into going through tight places; they are somewhat like sheep, and if the leader can be induced to go the rest will follow.

Next to satisfying a hearty appetite the height of mule joy is to roll. A mule will roll at every opportunity and often at inopportune times, when he makes the opportunity suit his own convenience. He dislikes mud and water holes in the road, and is what is known as a sure-footed animal.

PRODUCTION OF MULES.

The mule is a hybrid animal having a jackass, commonly called a jack, for a sire and a mare for a dam. When the reverse cross is made and the female ass (or jennet) is bred to a stallion, the off-

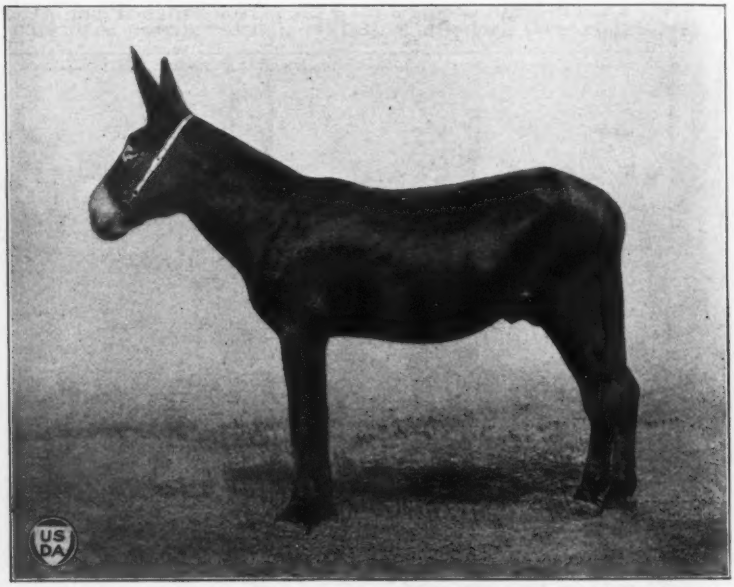


FIG. 3.—A prize-winning jack. Note size of bone and general quality throughout.

spring is called a "hinny." As the mule will not reproduce, it is necessary to maintain both jacks and mares in order to produce mules.

SELECTING THE JACK.

The importation of jacks, and consequently the production of mules, dates back to colonial times. About 1787 George Washington was presented with a jack by the King of Spain, which was used in the stud at Mount Vernon. Many good mules were produced in those days, and the value of the mule as a work animal was soon recognized by intelligent planters. It has been within the last 40 years, however, that the production of mules has been an extensive enterprise and that much attention has been given to the rearing and selection of the best jack stock.

The American jack of to-day is a composite of the bloods of some of the best foreign breeds, and in attaining the highest standard of excellence prevailing in the jack stock of America the breeders have emphasized the valuable utility points so much desired in the best jacks, such as size, weight, bone, style, quality, and action. In America jacks are usually spoken of as jennet jacks and mule jacks. As these terms imply, jennet jacks are used for mating with jennets for the reproduction of the breed, and mule jacks are used for mating with mares for the production of mules.

A good mule jack (Fig. 3) should be not less than 15 hands high and possess plenty of weight, large bone with quality, style, and action. The essential points of conformation in a good jack are a straight, strong back, closely coupled and well muscled over the loin; long and level rump; deep body and spring of rib to allow ample room for lung development. Vigor and strength of constitution are indicated by a broad chest and large heart girth.

The legs should be set straight, be well muscled, and have plenty of bone. The length of leg should be in proportion to depth of body, as height obtained by length of leg is undesirable. The size of the bone is very important and should be ample. The size of the bone is usually determined by measuring the cannon bone about half-way between the knee and the fetlock joint. This circumference should be 8½ inches in a jack of 15 hands' height. It is very desirable to have large, well-shaped feet. The head should be well proportioned, with the profile of the nose straight or slightly roman. The ears should be long, well set, and alert on a mature animal and should measure, horizontally, 33 inches or more in length from tip to tip.

Measurements of a good jack.[1]

[Weight, 1,200 pounds; height (standard measure), 15 hands, 3 inches.]

	Inches.		Inches.
Ears from tip to tip	34	Around body at girth	70
Around face and jaw	39	Around body at loin	67
Around neck at throatlatch	36	Around hoof, below coronet (next to hair)	16½
Around arm	21	Above hock	17½
Around cannon	8½	Below hock	9½
Length from poll to tail	84		

Some of the common defects in jacks which should be avoided are: Flat, narrow chest, which indicates a weak constitution and lack of vigor; light-muscled loin and long coupling; short, drooping rump; excessive length of leg; small feet with contracted heels; and short or droopy ears.

CARE OF THE JACK.

The proper care and management of the jack are somewhat exacting, as he is rather peculiar in his likes and dislikes. While a stallion may be spoiled because of his nervous temperament, the jack may be just as quickly spoiled because of his inclination to be sluggish. The jack should have a caretaker who understands jack man-

[1] Twice champion at the Missouri State Fair and reserve champion at the World's Fair, San Francisco.

agement thoroughly. This is very important, as the disposition of the jack is partly controlled by the groom. The jack should be quietly but firmly handled, as a bad disposition in a jack is usually attributable to harsh handling or mismanagement of the animal when young. Through continuous observation the groom should learn the peculiar individuality of the jack and the little things required for his proper management.

Abundant exercise is one of the big factors in the management of a breeding animal. A roomy, well-ventilated, and well-lighted box stall opening to an exercising paddock is necessary for the proper care of the jack. It is important that the exercising paddock be of good size. In order to insure plenty of exercise, however, it is well to give the jack some road work.

A young jack intended for siring mules should not be permitted to run with jennets or mules, as this practice usually leads to difficulty in teaching him to serve mares, when used in the stud. Instead the young jack should have fillies or gentle mares for companions. The jack may begin serving mares at the age of 2 or 2½ years, but he should not serve more than one mare a day during his first season nor more than 30 for the entire season. A mature jack may serve as many as two mares in a single day provided the two services are several hours apart. The number of mares a jack should serve during a season depends on the strength and vigor of the individual, but 70 or 80 mares probably is the maximum number that he can serve with satisfactory results. Artificial breeding may be employed if the jack is patronized very heavily. This not only conserves the vitality of the jack but also enables the owner to breed a much larger number of mares. If care and precaution are taken, artificial breeding may be practiced with as much success as breeding in the natural way. In fact, some mares which do not conceive from natural service are successfully impregnated artificially. It is sometimes advisable to use a stallion for teasing purposes in order to conserve the jack when the patronage is heavy.

FEEDS FOR THE JACK.

The jack is a rather sluggish animal, and for this reason his feeds should be slightly laxative in character. Bran, oats, crushed barley, and oil meal are splendid grain feeds to use. Sheaf oats and green feeds are also very satisfactory. Corn should be used only in limited amounts. Many jack breeders obtain good results by feeding sheaf oats, clover, and alfalfa hay.

THE BROOD MARE.

Sound brood mares of good quality should be selected in order to be successful in producing high-grade mules. Considerable effort is usually expended by the breeders of work horses in selecting good mares for breeding purposes, but no consistent effort is usually made by the mule breeder in exercising the same care in selecting brood mares for the production of mules. The idea seems to prevail that

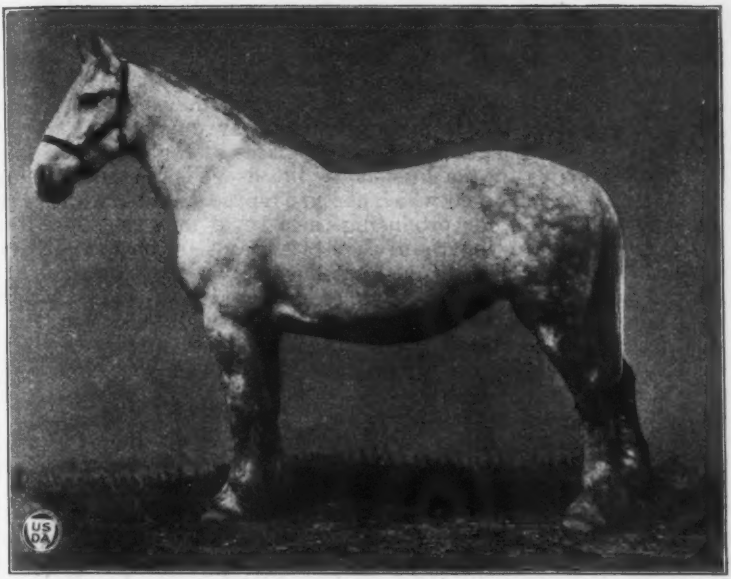


FIG. 4.—A desirable type of brood mare for producing draft mules. Note the "breediness," substance, and conformation of this mare.

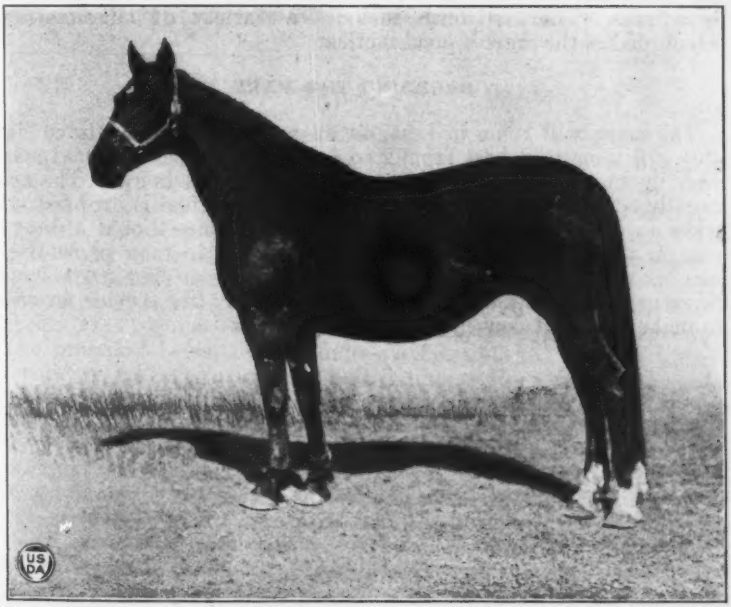


FIG. 5.—A desirable type of light "mule mare" for producing mules of quality. Note roominess of body, short back, depth of heart girth, and "breediness" of this mare.

a mare which is not suitable for breeding to a stallion is good enough to produce a mule. This is a mistake, for no matter how good the jack may be, it is inconsistent to expect uniformly good mule colts from inferior mares. The same care should be applied in selecting mule mares as is exercised in selecting brood mares to raise horse colts. The mares used in mule production are of no fixed type or breed and vary from the large, heavy mares of the draft breeds to the smaller mares of the light-horse breeds (Figs. 4 and 5). As the mule is a work animal which can not reproduce its kind, it is not essential that mares for producing them be of any fixed breeding. Mules from the larger mares of the draft breeds are large and heavy and are excellent for draft purposes, but they are more sluggish and can not stand heat so well as mules produced from mares having light-horse blood in their veins. Experienced breeders state that a very desirable mule mare is one having about one-fourth draft blood. A mare of this breeding will produce good-sized mules, with style, action, and stamina. It seems that type rather than breeding is the prime requisite of a good mule mare.

In conformation the mule mare should possess all the good qualities desired in the brood mare used for producing good work horses. Some of the most important points of the good mule mare are:

A broad chest and large heart girth, indicating a vigorous constitution; a roomy barrel to allow for full development of the fetus; a straight back, strongly muscled over the loins; well-set legs with broad, flat bone, sound and of good quality; large and well-shaped feet; and feminine character, indicating "breediness." To sum up, the mare should combine size with quality, type, soundness, and breediness. The last term includes a variety of characteristics which makes the mare a good mother.

BREEDING THE MARE.

The mare will come in heat, on an average, every 18 to 21 days and will remain in heat from 2 to 4 days, though exceptional mares vary in this respect and remain in heat only a few hours. The mare usually comes in heat on the ninth day after the foal is dropped. In order to avoid accidents at breeding time, hobbles should always be put on the mare. Conception is more likely to take place if the mare is rested for a few hours at time of service. The mare should be returned to the jack in from 18 to 21 days after service, in order to make sure that conception has taken place.

TABLE 1.—*Calendar showing time of service and date of foaling based on 340-day gestation period for mares.*

Day of month mare is bred.	Date of foaling.											
	Bred in Jan.	Bred in Feb.	Bred in Mar.	Bred in Apr.	Bred in May.	Bred in June.	Bred in July.	Bred in Aug.	Bred in Sept.	Bred in Oct.	Bred in Nov.	Bred in Dec.
	Dec.	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May.*	*June.*	*July.*	*Aug.*	*Sept.*	*Oct.*	*Nov.*
1	6	6	3	6	5	6	5	6	6	5	6	5
2	7	7	4	7	6	7	6	7	7	6	7	6
3	8	8	5	8	7	8	7	8	8	7	8	7
4	9	9	6	9	8	9	8	9	9	8	9	8
5	10	10	7	10	9	10	9	10	10	9	10	9
6	11	11	8	11	10	11	10	11	11	10	11	10
7	12	12	9	12	11	12	11	12	12	11	12	11
8	13	13	10	13	12	13	12	13	13	12	13	12
9	14	14	11	14	13	14	13	14	14	13	14	13
10	15	15	12	15	14	15	14	15	15	14	15	14
11	16	16	13	16	15	16	15	16	16	15	16	15
12	17	17	14	17	16	17	16	17	17	16	17	16
13	18	18	15	18	17	18	17	18	18	17	18	17
14	19	19	16	19	18	19	18	19	19	18	19	18
15	20	20	17	20	19	20	19	20	20	19	20	19
16	21	21	18	21	20	21	20	21	21	20	21	20
17	22	22	19	22	21	22	21	22	22	21	22	21
18	23	23	20	23	22	23	22	23	23	22	23	22
19	24	24	21	24	23	24	23	24	24	23	24	23
20	25	25	22	25	24	25	24	25	25	24	25	24
21	26	26	23	26	25	26	25	26	26	25	26	25
22	27	27	24	27	26	27	26	27	27	26	27	26
23	28	28	25	28	27	28	27	28	28	27	28	27
24	29	29	26	29	28	29	28	29	29	28	29	28
25	30	30	27	30	29	30	29	30	30	29	30	29
26	31	31	28	31	30	31	30	31	31	30	31	30
	Jan.	*Feb.*	*Mar.*	*Apr.*	*May.*	*June.*	*July.*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
27	1	1	1	1	1	1	1	1	1	1	1	1
28	2	2	2	2	2	2	2	2	2	2	2	2
29	3	.....	3	3	3	3	3	3	3	3	3	3
30	4	.....	4	4	4	4	4	4	4	4	4	4
31	5	.....	5	.....	5	.....	5	5	.....	5	.....	5

CARE OF THE PREGNANT MARE.

There should be no sudden changes in feed or work of the mare after she becomes pregnant. She should be given a well-balanced ration of feed that will supply the needs of her own body as well as those of the growing fetus. Feeds that are too fattening should be avoided, also moldy or damaged hay, as there is a suspicion that either may cause abortion. Exercise is a most important essential to the health of the pregnant mare, as well as for the development of a strong, healthy foal. The best and most economical way of giving this exercise is by using the mare in regular farm work. The pregnant brood mare should not be subjected to hard pulls or severe strains. By using care and judgment the mare may be safely worked up to within a week or ten days of foaling. The average gestation period of mares—that is, the length of time that they carry their foals—is about 340 days. This period varies slightly with individual mares. It is important that a careful record be kept of the date of service to the jack in order that the time of foaling may be anticipated. A very sure sign that the foal will be dropped in a short while is the appearance of wax on the teats, which usually appears two or three days before parturition.

CARE OF MARE AT FOALING TIME.

About a week or ten days before the foal is expected the mare should be turned into a pasture or paddock, where there is no danger of injury from other animals. If the weather is mild, a paddock or pasture is a desirable place for the foal to be delivered. There is probably less danger of infection in a pasture than in a stable. If desirable conditions for foaling outside can not be provided for, a roomy box stall that has been well cleaned out, disinfected, and bedded with fresh straw should be provided.

It is well to observe the mare closely when the foal is expected, in order that assistance may be given in delivery if necessary. It will be necessary for the attendant to be where he can see the mare and yet be unseen by her. Should she need assistance, a veterinarian should be summoned at once. If it is essential that aid be given, the service should be rendered by one who has had experience with and understands the many phases of difficult parturition.

If the foal has been delivered satisfactorily, the attendant should remove as soon as possible any tissue or matter that may be clogging its nostrils and see that respiration is started. Assistance may be rendered in this respect by blowing into the foal's nostrils and rubbing its sides with a cloth or wisp of straw. As soon as practicable, without disturbing the mare unnecessarily, remove the afterbirth from the proximity of the mare and, if foaling occurred in a stable, clean out the bedding that has been soiled during parturition, sprinkle lime on the floor where the bedding has been removed, and supply fresh bedding.

To prevent infection, the navel cord of the foal should be saturated with full-strength tincture of iodin or a solution of 1 to 1,000 corrosive sublimate, and then dusted with powdered slaked lime. This should be repeated each day until the navel cord drops off. A normal foal will usually find its own way to the mare's udder soon after arrival. If, however, the foal is weak and unable to stand within two or three hours after birth, it should be assisted in getting its first meal. It is very important that the newborn foal get the first milk from its dam, which is a substance called colostrum. In addition to having the food properties so much needed by the new born, the colostrum also has a purgative effect, which stimulates the action of the digestive tract in eliminating the fecal matter already collected during the period of gestation. If this fecal matter is not eliminated within 24 hours after the colt is born, a dose of castor oil (2 to 4 tablespoons) shaken well in milk should be given and repeated in three or four hours until the desired results are obtained.

CARE OF MARE AND FOAL.

The mare should receive bran mashes and light feeds until she has recovered from the effects of foaling and the feverish condition of her system has disappeared. The ration should then be increased gradually until the mare is on full feed.

When the weather is warm and pleasant, the mare and foal may be turned out on pasture or paddock as soon as the foal is able to follow, as exercise is very beneficial and they will thrive better in the open.

If the mare was being worked prior to foaling, she will be ready for work again in 10 days or two weeks after the colt is born. When this is done the colt should be confined in a stable or paddock and not permitted to follow in the fields. The mare and colt will fret for each other for a while, but they will soon become accustomed to separation. When working, the mare should be returned to the stable once in the forenoon and in the midafternoon to allow the colt to suckle. The mare should be allowed to cool before being turned in with the colt, as there is danger of causing the colt to have scours and other digestive troubles if the mare is overheated when nursing.

When the mare is idle during the fly season, it is best to keep her and her foal in a darkened stable in the day and turn them out on pasture at night. The mare should be fed some grain and hay, as grass alone will not supply the needs of her body and also provide a sufficient milk flow for the colt.

The colt usually begins to eat a small amount of grain at the age of three or four weeks. Oatmeal should be the first grain fed and bran may be added later. Best results in feeding grain to colts in the open are obtained by building a creep under which they may pass at all times and which will prevent the mares or other mature horses from reaching the feed provided for the colts. The colt will eat only a little grain at first, but it is worth much to have it begin eating a small amount as soon as possible, because the more accustomed it becomes to eating grain while young the less trouble there will be at weaning time. The mare may be induced to frequent the creep by giving her an occasional feed near there also.

WEANING THE COLT.

Under ordinary conditions the colt is usually weaned when about six months old, but if the mare is working and the colt is thrifty it may be weaned earlier. When the colt has been taught to eat grain early, this separation from its dam need not cause any check in the colt's development. This is a trying time in the life of a colt, however, and it should receive additional feed and care to make up for the loss of the mother's milk from its ration. When the colt is once taken away from the mare, the separation should be made complete.

The mare requires some individual attention at weaning time. It will be necessary to milk her by hand for a few days to prevent too much milk from collecting in the udder and causing it to become caked and swollen. To assist in the drying-up process, the mare should be milked only partially dry and if the milk flow is maintained the grain ration should be reduced for a few days.

CARE OF THE COLT AFTER WEANING.

At no time in the colt's life is pasture more important than at the time of weaning. On being taken away from its dam, the colt needs succulent feed and the best way of supplying this feed is by having a good pasture. Not only is a good pasture necessary for the development of the colt, but it is also necessary if the colt is to be raised in an economical manner. In addition to the pasture the colt should

receive liberal amounts of grain and hay. Half of its growth is made during its first year and it should have every advantage possible for its development. Colts like companionship and they do better if several are allowed to run together (Fig. 6).

THE ORPHAN COLT.

It may happen sometimes that the mare dies soon after foaling or fails to give milk enough for her foal. When either of these misfortunes occurs the colt must be raised by hand, which is a tedious undertaking but is worth while if done properly. As a feed for the orphan colt, the best and most practical substitute for mare's milk is cow's milk after it has been prepared to conform as nearly as possible

FIG. 6.—Mule foals like companionship. A group of weanlings on pasture.

in composition to the milk of the mare. This is done by selecting milk that is low in butterfat and diluting it with one part of fresh water for three parts of milk. Add a tablespoon of sugar and three or four tablespoons of limewater to a pint of this diluted milk and heat to body temperature. Give the foal about a half teacup of this prepared milk at first and at short intervals gradually increase the amount and the length of time between feeding periods as the foal develops. A bottle with a rubber nipple attached is the most convenient way to give milk to the orphan. As the foal suckles frequently in small amounts when following its dam, one should feed it frequently and thus conform as nearly to natural conditions as possible.

The utensils used in feeding the orphan foal should be kept scrupulously clean. This can be done by freely utilizing hot water and sunshine, both of which are enemies to germs that collect and thrive in milk containers.

SPRING OR FALL COLTS.

The climatic conditions and nature of the farm work determine largely whether it is best to have the colts come in the spring or in the fall.

The natural breeding season for mares is in the spring, which is the generally accepted time to have colts. There are, however, several advantages of having fall colts, especially in the South. The fall-born colt comes at a time when the mare can probably be more easily spared from farm work and at a time when flies are not so abundant. Another advantage is that the fall colt is weaned at a time when it can be turned on to pasture and its development is not retarded at this critical time. The spring colt is weaned at a time when the grazing season is practically over.

EDUCATING THE COLT.

The time to begin the education of the colt is early in its life. It should be halterbroken and taught to be led when a few weeks old. The more the colt is handled when young the fewer difficulties will be encountered later when it is desired to put him to work.

Mules reach maturity at the age of 5 years, but they may be given light work when 3 years old. Care should be taken not to overload young mules. Overtaxing the young animal not only tends to check its development but also causes it to become unreliable as a worker, and possibly balky. A young mule that becomes accustomed to moving a load every time it is called upon will develop into a reliable work animal.

FEEDING AND CARE OF MULES.

Too little thought and attention are usually given to the proper methods of management and feeding of mules. Where the use of mules as work stock prevails, the feeding is usually done in a haphazard manner without regard to efficiency and economy. The essentials of a good caretaker are judgment and common sense combined with some knowledge of feeds. The most practical feeds to use are those which are grown on the farm or plantation so far as they provide the essential nutrients for a balanced ration. Corn, oats, and barley are the most widely used grains, as there is hardly a section of the United States where one or more of these grains are not grown. These grains may be combined to make a satisfactory feed or taken singly and supplemented with such feeds as bran, oil meal, or cottonseed meal to make a balanced ration. A balanced ration is one which will supply the protein and carbohydrate elements in such proportion as to meet as nearly as possible the body requirements of the animal for doing the work which it is to perform.[2] The same principles that are used in the correct feeding of horses may also be applied to the feeding of mules. As a general rule 1.1 pounds of grain and 1¼ pounds of hay daily per 100 pounds of live weight will be found to be about the right amount of feed to use for an animal at medium work. The exact

[2] Methods of computing a balanced ration are fully explained in Farmers' Bulletin 1030, Feeding Horses, which may be obtained on request from the Division of Publications, Department of Agriculture, Washington, D. C.

quantity of feed depends upon the individual animal and must be determined by the feeder.

While there are many cases in which mules are underfed, there are probably many others in which the owner suffers financially because the mules are fed more high-priced feeds than they really need, through the use of improperly balanced rations. Overfeeding is most likely to be done during the winter months, when the mules are idle. During this period idle mules may be kept in good condition largely on hay and straw and a small amount of grain. Mules that are worked hard and are receiving heavy rations should have their feed allowance diminished when idle. Idle mules thrive better if they are not confined in stables but are kept in the open.

Digestive disorders are more prevalent among work stock during the spring and summer months than at any other time. This is due to the improper feeding and watering of overheated animals. If the work animal appears to be excessively warm when brought in from work, it should be permitted to cool off before watering or feeding. Attention to such details will prevent many cases of colic. Mules sometimes suffer in hot weather from heat because they are allowed to eat too much grain or hay. This is most likely to occur when fresh, new hay is being fed. The hay ration should be fed mainly at night so that there will be several hours in which the mule may partly digest and assimilate this bulky feed before going to work.

Mules like to roll after being unharnessed, and they should have a place where they may rest themselves in this way. They will be much more comfortable in summer if they are turned out of their stables at night after they have cleaned up their feed. If they are turned on to pasture at night they will sweat more the next day, but the beneficial effects obtained from the grass and being in the open will more than offset the effects of excessive sweating. If unable to provide pasture for the mules at night during the summer, a paddock or lot should be provided where they may be comfortable.

JUDGING MULES.

The general form and appearance of the mule should resemble closely that of a horse, and in judging mules the same general points of perfection are looked for. The nearer the mule approaches the ideal desired in a draft horse the more valuable he is from a market standpoint. In the mule there are certain characteristics derived from his paternal side which are mainly indicated in his bray, disposition, ears, tail, and feet, aside from which the mule does not differ materially from the dam.

Mules vary in height from the little 12-hand pit mules to the large draft mules standing 17½ hands. The range in height of various classes of mules is given in another portion of this bulletin under "Market classes of mules."

The weight of mules varies from 600 pounds to 1,600 pounds. The average weight of the larger type of mules varies between 1,150 and 1,400 pounds and is the range of weight within which the majority of the most marketable mules are classified.

The form of the mule should be compact, with a deep body, broad chest, full flanks, short back, and well-sprung ribs. Light, waspy flanks, long narrow bodies, and long backs are not desirable.

Quality is rather difficult to define, but is that which every capable judge looks for in any animal. It is indicated in a mule by a trim, fine ear, clean-cut head and joints, flinty flat bone, well-defined tendons, and soft, silky hair. Quality marks the difference between a "market topper" and a "jar head." A short, thick ear, a coarse head, round, spongy bone, and a harsh coat of hair are indications which the judge should discriminate against.

The natural tendency of the mule is to be lazy and obstinate. An active, energetic mule is much desired.

It is in the hind quarters of the mule that the greatest faults of conformation are usually found. The croup is often very short

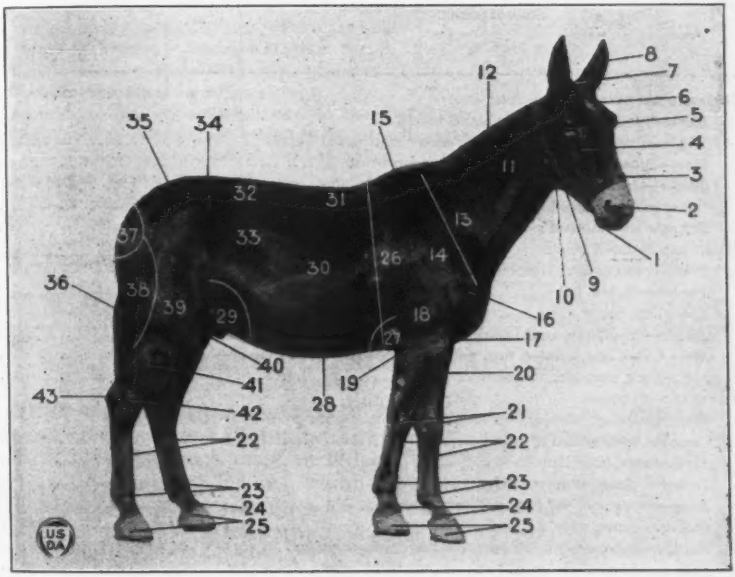


FIG. 7.—The points of the mule: 1, mouth; 2, nostril; 3, nose; 4, face; 5, eye; 6, forehead; 7, poll; 8, ear; 9, throatlatch; 10, neck; 11, crest; 12, shoulder bed; 13, shoulder; 14, withers; 15, point of shoulder; 16, breast; 17, arm; 18, elbow; 19, forearm; 20, knees; 21, cannons; 22, fetlocks; 23 pasterns; 24, feet; 25, heart girth; 26, fore flank; 27, underline; 28, hind flank; 29, barrel; 30, back; 31, loin; 32, coupling; 33, point of hip; 34, hip; 35, croup; 36, tail head; 37, buttock; 38, thigh; 39, quarters; 40, tail; 41, stifle; 42, gaskin; 43, hock.

and steep, the hips sloping, the thighs narrow, and the hind legs sickle shaped. These are faults of conformation that judges should discriminate against sharply. It is in the hind quarters and loins that the draft animal obtains propelling power. These portions of the animal, therefore, should be correctly built and properly developed. The loins should be broad, short, and thickly muscled; the croup long and level; the hips long, level, and muscular; the thighs thick,

long, and well muscled; and the hind legs well set, with broad, clean-cut hocks and flat, dense bone. The mule should stand on good feet that are well shaped.

While the mule is essentially a draft animal, it is used widely for general utility purposes, especially in the South. Though style and action may not be so important qualities in a mule as they are in the lighter breeds of horses, these qualities add materially to its value. A smart, alert mule, with a long, free stride at the walk and a snappy, balanced trot is highly desired. Figure 7 and the accompanying score card give points in the study of conformation.

Score Card for the Mule.

Scale of points.	Standard score.	Points given animal judged.	
		Student's score.	Corrected score.
GENERAL APPEARANCE—16 points:			
Height—Estimated hands....; actual hands.....			
Weight—Estimated....; actual....; according to age and type....	4		
Form—Broad, deep, compact, smooth, symmetrical.....	4		
Quality—Clean, dense bone with sufficient substance; refined head and ears; fine hair; defined joints and tendons.....	4		
Temperament—Active; good disposition.....	4		
HEAD AND NECK—7 points:			
Head—Proportionate; clear-cut features.....	1		
Forehead—Broad, full.....	1		
Eyes—Full, bright, clear.....	1		
Muzzle—Broad, fine; large nostrils; trim and even lips.....	1		
Ears—Large, long, pointed, fine, well set, carried alert.....	1		
Neck—Long, muscular, clean-cut throatlatch.....	2		
FOREHAND—24 points:			
Shoulders—Long, sloping, smooth, muscular, blending into smooth, well-defined withers.....	3		
Arms—Short, muscular, elbow in.....	1		
Forearms—Long, wide, muscular.....	2		
Knees—Straight, wide, deep, well supported.....	2		
Cannons—Short, wide, flat, well-defined tendons.....	2		
Fetlocks—Wide, straight, tendons well back, well supported.....	1		
Pasterns—Of medium length, oblique (about 45°), clean, strong..	3		
Feet—Of medium size, set straight; dense, smooth horn; slope of wall parallel to pastern; wide, high heels; concave sole; strong bars; prominent, elastic frog.....	6		
Leg position—In front, a perpendicular line from point of shoulder should divide the leg and foot into lateral halves; from the side, a similar line from the bony prominence on shoulder blade should pass through the center of elbow, knee, and pastern joints, and meet the ground back of foot.....	4		
BODY—9 points:			
Chest—Deep, wide.....	2		
Ribs—Long, well sprung, close.....	2		
Back—Short, broad, strong.....	2		
Loin—Short, wide, muscular.....	2		
Flanks—Deep, full; long, low underline.....	1		

Score Card for the Mule—Continued.

Scale of points.	Standard score.	Points given animal judged.	
		Student's score.	Corrected score.
HIND QUARTERS—32 points:			
Hips—Wide, level, smooth, muscular	2		
Croup—Long, level, muscular	2		
Tail—Set high, well carried	1		
Quarters and thighs—Deep and muscular; strongly joined to gaskins	3		
Stifles—Broad, thick, strong	1		
Gaskins—(Lower thighs) long, wide, muscular	2		
Hocks—Straight, wide, prominent points, deep, flat, clean-cut, well supported	6		
Cannons—Similar to front, but a trifle longer and wider	2		
Fetlocks—Wide, straight, tendons well back	2		
Pasterns—Similar to front, but less sloping (about 55°)	3		
Feet—Similar to front, but not quite as large	4		
Leg position—From rear, a perpendicular line from point of buttock should divide the leg and foot into lateral halves; from the side, this same line should touch the point of hock and run parallel to the cannon. A similar line from hip joint should meet the ground midway between heel and toe	4		
ACTION—12 points:			
Walk—Active, straight, balanced, long stride	7		
Trot—Straight, long, free, regular, snappy stride	5		
Total	100		

MARKET CLASSES OF MULES.

Mules are classified according to their use. There are many local market classifications of mules, but they may be grouped into five general classes. Each class includes mules of a general type, while there are various grades and weights within a specific class.

The general classes of mules are shown in the table.

TABLE 2.—*Ranges in height and weight of various classes of mules.*[a]

Class.	Range in height.	Range in weight.
	Hands.	*Pounds.*
Draft	16 to 17½	1,200 to 1,600
Farm	15½ to 16	900 to 1,250
Sugar	16 to 17	1,150 to 1,300
Cotton	13½ to 15½	750 to 1,100
Mining	12 to 16	600 to 1,350

Each of the classes is graded according to conformation, soundness, quality, condition, and action into the following grades: Choice, good, medium, common, inferior.

[a] Market Classes and Grades of Horses and Mules. Bulletin 122, Illinois Agricultural Experiment Station, 2d ed. 1912.

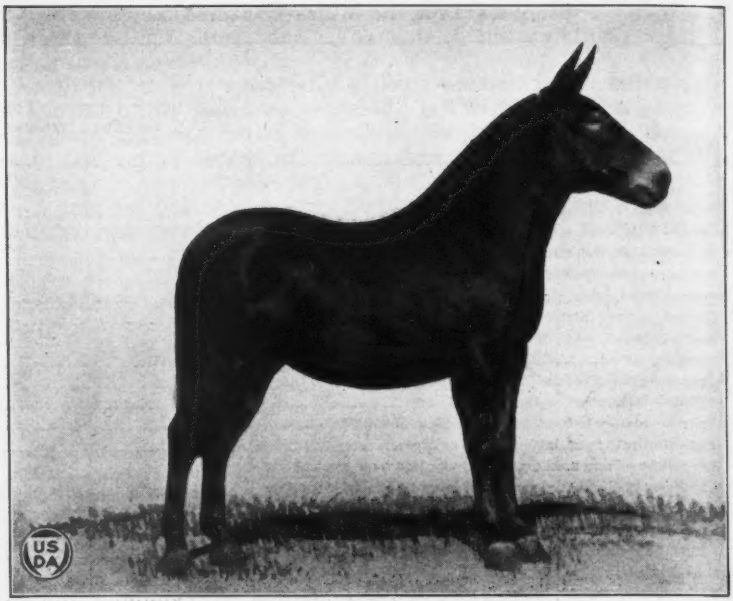


FIG. 8.—A choice draft mule. Champion mule at American Royal Livestock Show, Kansas City, Mo., 1922.

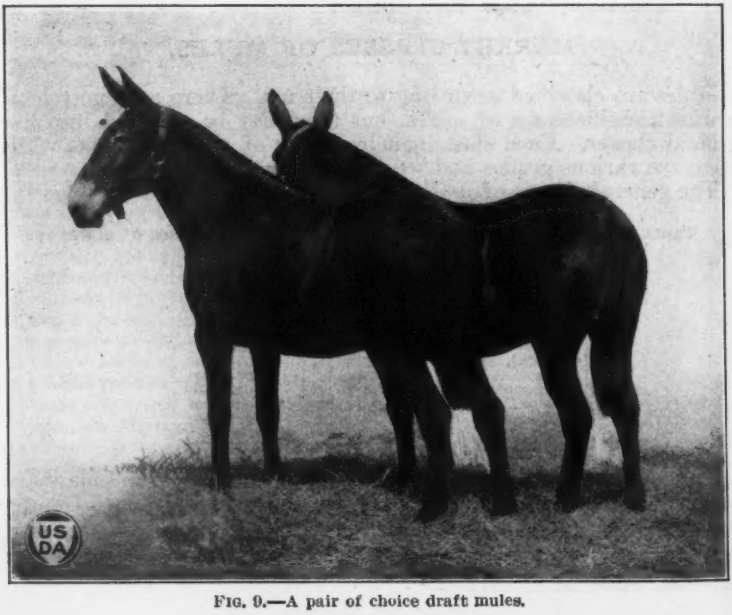


FIG. 9.—A pair of choice draft mules.

DRAFT MULES.

The draft-mule class includes the largest mules (Figs. 8, 9, 10), standing from 16 to 17½ hands and weighing from 1,200 to 1,600 pounds. Some exceptional draft mules exceed the maximum weight given for this class. They are used largely for heavy teaming in large cities, especially in the warmer climates; for contract jobs, such as road grading and railroad work; and for lumber work. Mules for contract work are usually designated by an appropriate descriptive name, such, for instance, as "railroaders." The heaviest draft mules find their way to the lumber camps. Contract mules

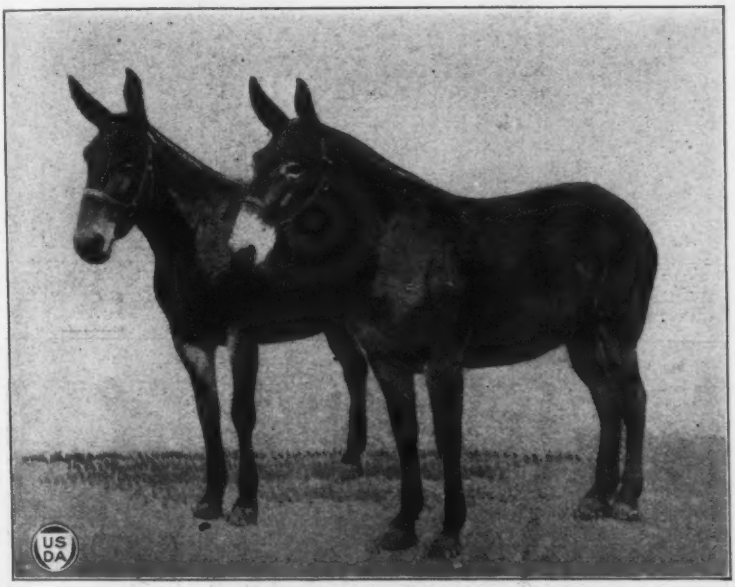


FIG. 10.—A pair of good draft mules.

must have more quality than lumber mules, but extreme weight is not so essential. The greatest demand for draft mules is for those between the ages of 5 and 8 years.

There is no special preference in regard to sex. The highest prices paid are for those mules having weight combined with heavy bone, large, well-shaped feet, strong, short backs, closely coupled with abundant muscling over the loin and hind quarters.

FARM MULES.

Mules purchased in the market for farm work in the Middle Western States are known as "farm mules." There is more variation in quality and type in this class than in any other class, as the demand for a specific type is not so well defined (Figs. 11, 12, 13, 14).

FIG. 11.—A pair of large farm mules.

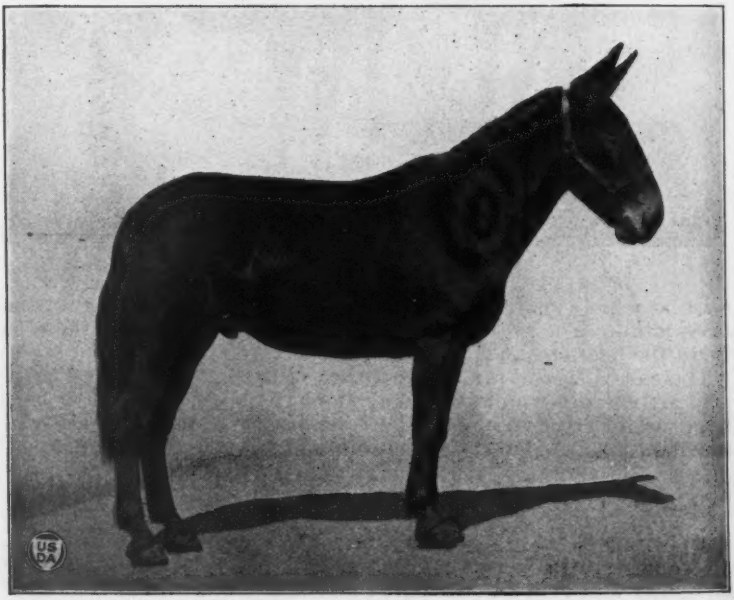


FIG. 12.—A good farm mule.

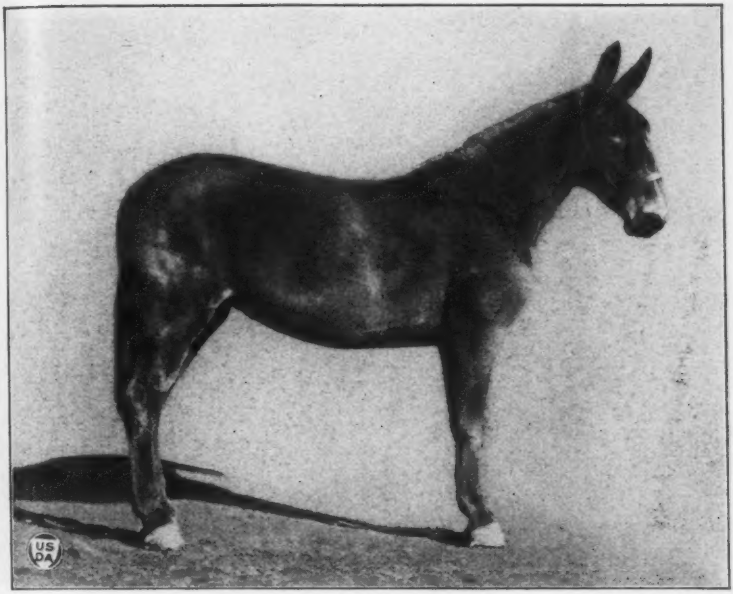


FIG. 13.—A medium farm mule.

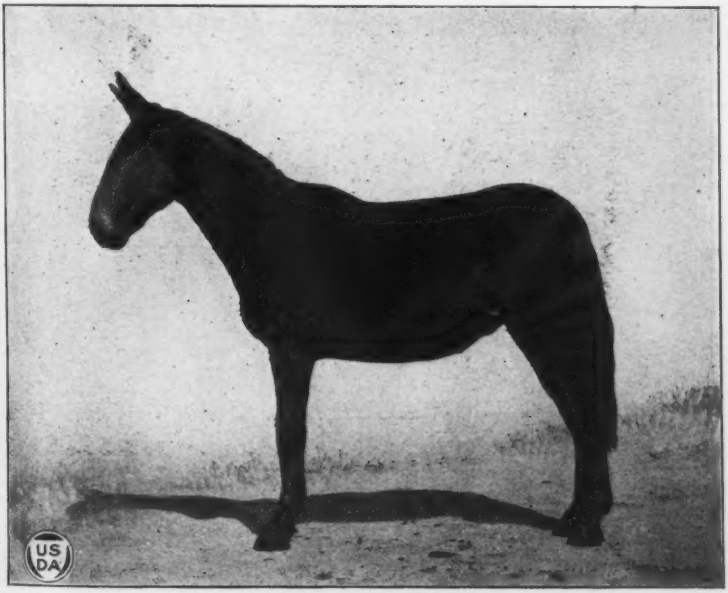


FIG. 14.—Common farm mule.

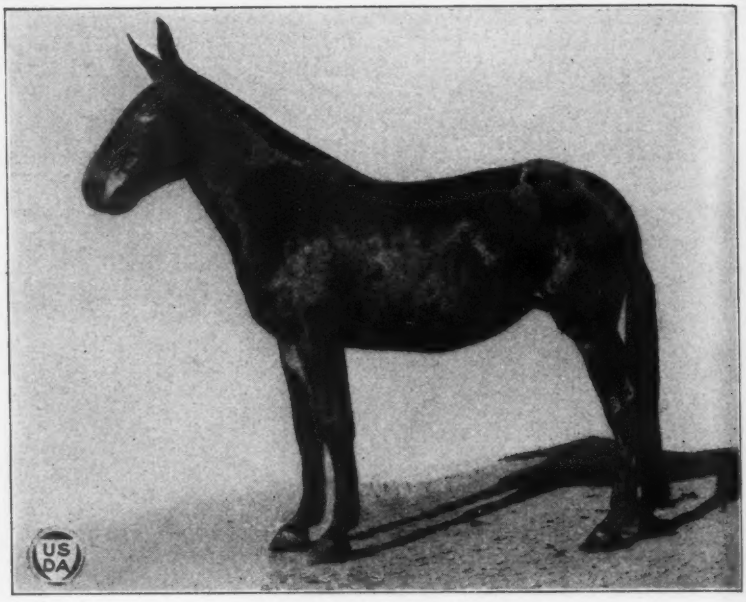


FIG. 15.—A choice sugar mule.

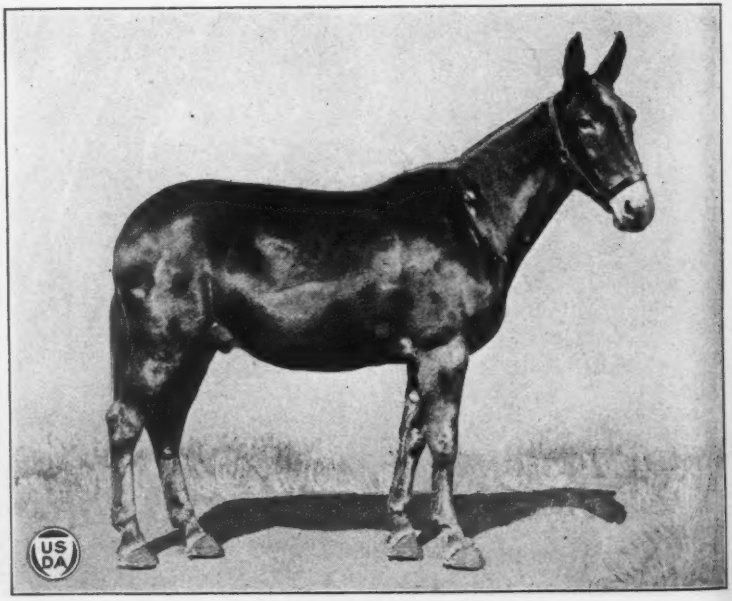


FIG. 16.—A good sugar mule.

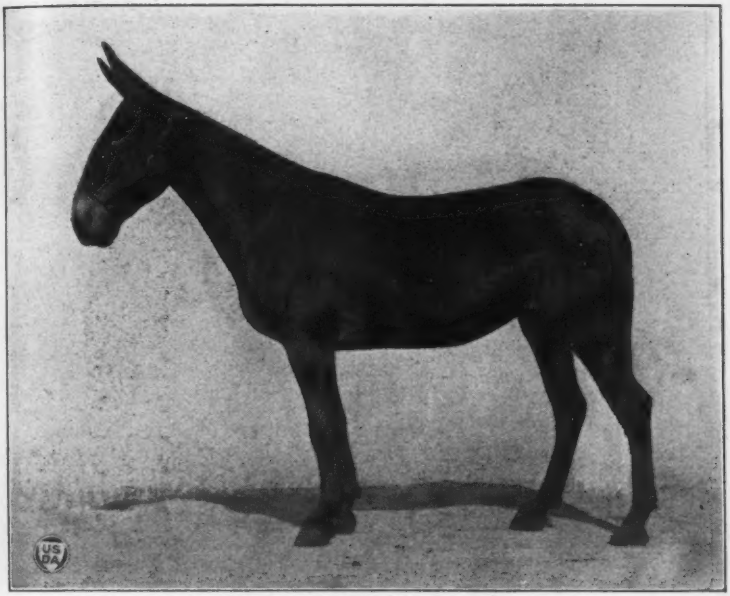


FIG. 17.—Common sugar mule.

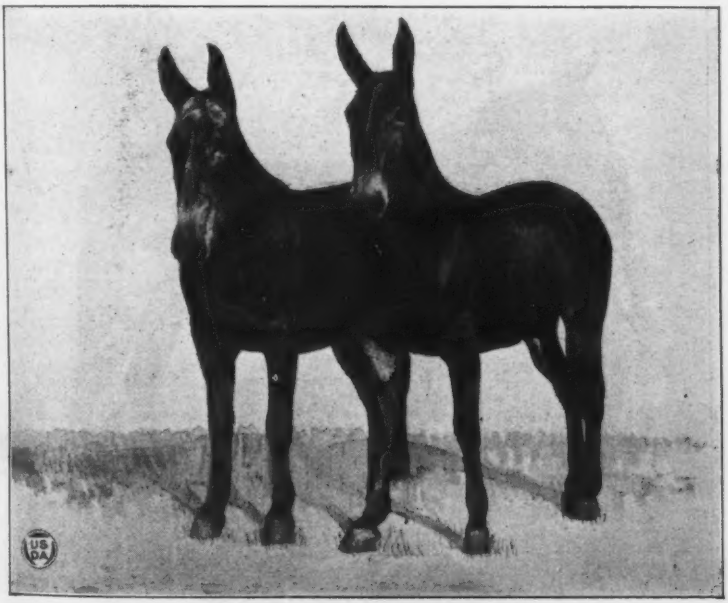


FIG. 18.—A team of choice cotton mules.

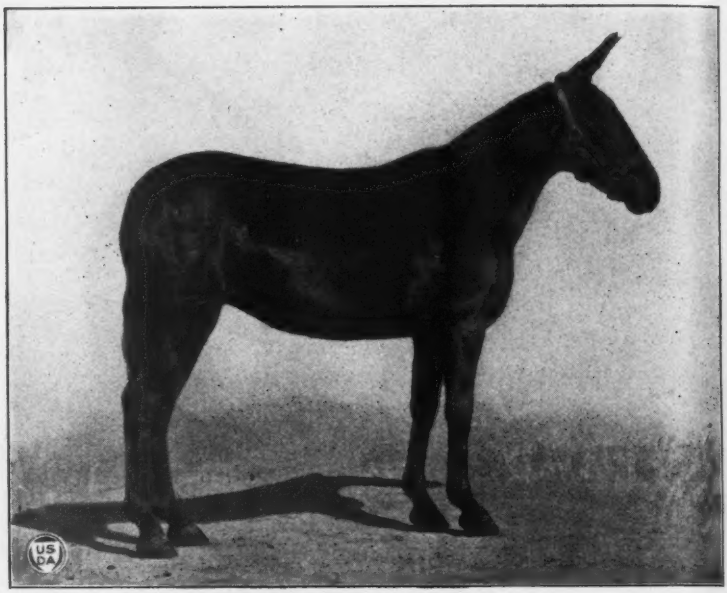


FIG. 19.—A good cotton mule.

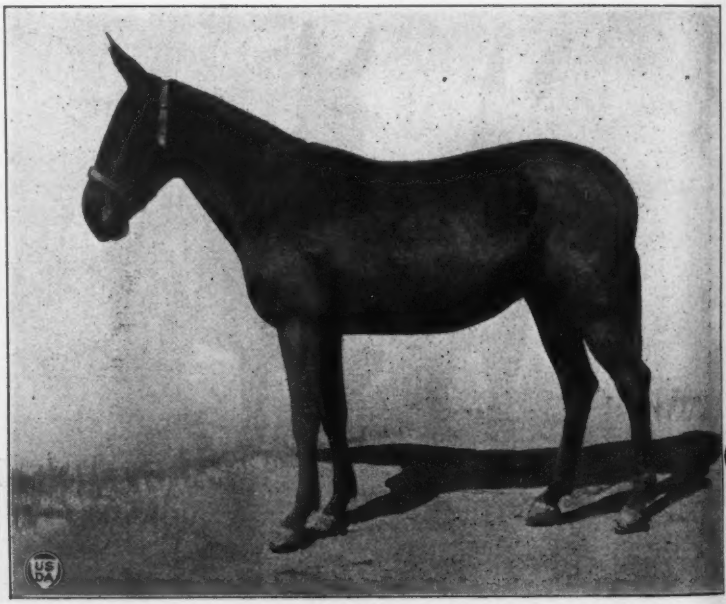


FIG. 20.—A medium cotton mule.

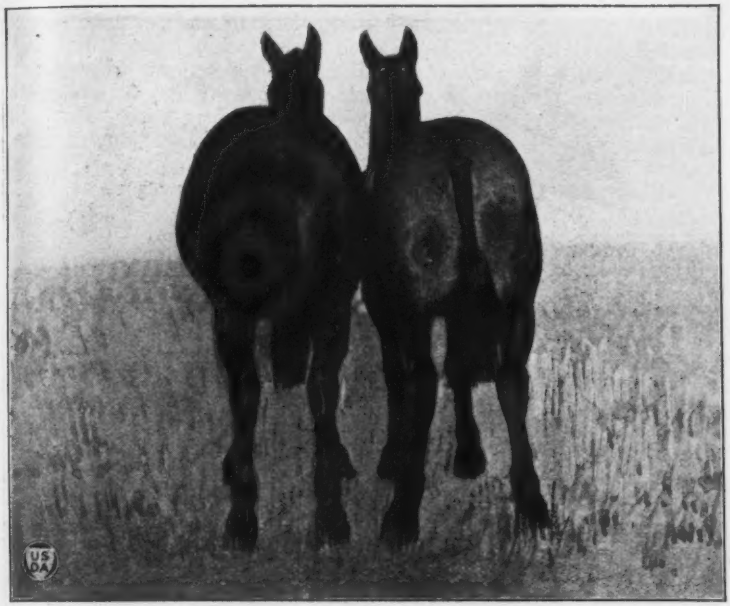


FIG. 21.—A team of choice surface mining mules.

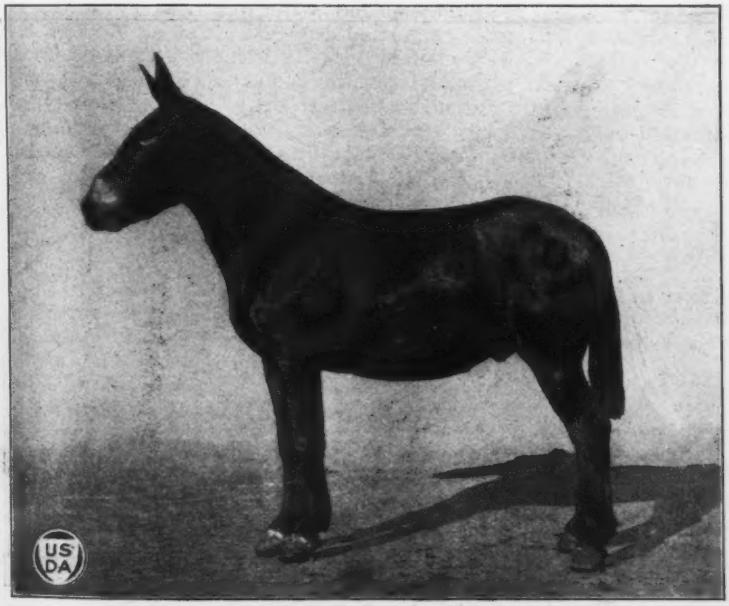


FIG. 22.—A choice surface mining mule.

FIG. 23.—A choice pit mining mule.

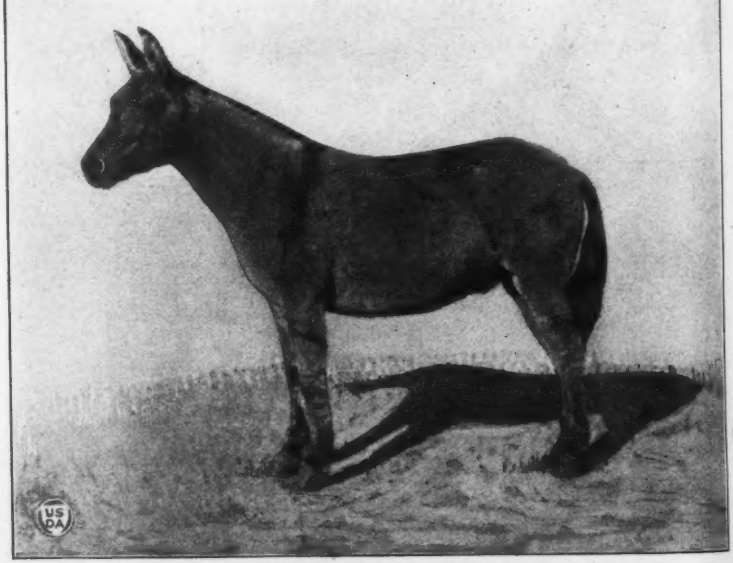


FIG. 24.—A good pit mining mule.

Mules in this class may be plain draft mules or cotton mules that lack finish and condition, as the farmer likes to buy mules with a prospect of developing them into more valuable animals. Many of them are worked for a season and then fitted for the market, where they are placed into one of the other specific classes, such as "drafters," "sugar mules," "cotton mules," "miners," or "railroaders."

SUGAR MULES.

Sugar mules are those which are purchased for shipment to the sugar plantations of the South. This class of mules is somewhat rangy in type and should have quality, style, and finish. The mules in this class are heavier and more compact than cotton mules, but not so heavy as draft mules. The range in weight is from 1,150 to 1,300 pounds. In selecting sugar mules special attention should be given to quality and adaptability to the work. The feet should be large and well shaped. Mare mules are preferred for the sugar trade (Figs. 15, 16, 17).

COTTON MULES.

As the name implies, cotton mules are purchased for cotton plantations. The type (Figs. 18, 19, 20) is somewhat lighter and more angular than the sugar or surface-mining mule and heavier than the pit mule. While there is a gradation of quality and age in this market class, the planters of the South are becoming more and more inclined to increased weight and quality in their mules than prevailed a few years ago. A choice cotton mule weighs about 1,150 pounds and is alert and active, but most mules in this class vary from 750 to 1,100 pounds. The custom in the Cotton Belt is to buy mules in the spring for the crop season and dispose of them in the fall. As they are usually in poor condition following the heavy summer's work, they are sold in the fall for a fraction of the purchase price. These mules are wintered, fattened, and sold back to the planter in the spring. For this reason the age limits within this class are variable. Mules from 5 to 7 years old are preferred, however, for this trade and bring the best prices.

MINING MULES.

There is a wide range in weight among mining mules, varying from 600-pound pit mules to 1,350-pound surface mules (Figs. 21, 22, 23, 24). Good feet and freedom from blemishes are requirements for mules to qualify for top prices for the mining trade.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE.

Secretary of Agriculture	HENRY C. WALLACE.
Assistant Secretary	C. W. PUGSLEY.
Director of Scientific Work	E. D. BALL.
Director of Regulatory Work:	
Weather Bureau	CHARLES F. MARVIN, *Chief.*
Bureau of Agricultural Economics	HENRY C. TAYLOR, *Chief.*
Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Bureau of Plant Industry	WILLIAM A. TAYLOR, *Chief.*
Forest Service	W. B. GREELEY, *Chief.*
Bureau of Chemistry	WALTER G. CAMPBELL, *Acting Chief.*
Bureau of Soils	MILTON WHITNEY, *Chief.*
Bureau of Entomology	L. O. HOWARD, *Chief.*
Bureau of Biological Survey	E. W. NELSON, *Chief.*
Bureau of Public Roads	THOMAS H. MACDONALD, *Chief.*
Fixed Nitrogen Research Laboratory	F. G. COTTRELL, *Director.*
Division of Accounts and Disbursements	A. ZAPPONE, *Chief.*
Division of Publications	EDWIN C. POWELL, *Acting Chief.*
Library	CLARIBEL R. BARNETT, *Librarian.*
States Relations Service	A. C. TRUE, *Director.*
Federal Horticultural Board	C. L. MARLATT, *Chairman.*
Insecticide and Fungicide Board	J. K. HAYWOOD, *Chairman.*
Packers and Stockyards Administration *Grain Futures Trading Act Administration*	CHESTER MORRILL, *Assistant to the Secretary.*
Office of the Solicitor	R. W. WILLIAMS, *Solicitor.*

This bulletin is a contribution from

Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Animal Husbandry Division	L. J. COLE, *Acting Chief.*

28

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
5 CENTS PER COPY

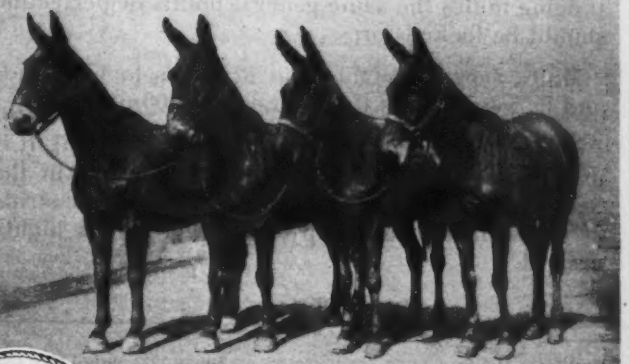
PURCHASER AGREES NOT TO RESELL OR DISTRIBUTE THIS COPY FOR PROFIT.—PUB. RES. 57, APPROVED MAY 11, 1922

U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1341 rev. May 1926

Rev.ed. follows

MULE PRODUCTION



XUM

THE ABILITY of the mule to endure hardship and perform sterling service under adverse conditions has established him as a real asset in American agriculture.

The mule will give best service under favorable conditions of feeding and management.

Good, sound mares should be selected for breeding in order to be successful in producing high-grade mules. A very desirable "mule mare" is one having about one-fourth draft blood.

The most practical feeds to use for mules are those which are grown on the farm or plantation so far as they provide the essential nutrients for a balanced ration.

The general form and appearance of the mule should resemble closely that of a horse, and in judging mules the same general points of perfection should be looked for.

Mules vary in height from 12 hands to 17½ hands and in weight from 600 pounds to 1,600 pounds.

While the mule is essentially a draft animal, it is used widely for utility purposes, especially in the South. A smart, alert mule, with a long, free stride at the walk and a snappy, balanced trot is highly desired.

Washington, D. C. August, 1923; revised May, 1926

MULE PRODUCTION.[1]

By J. O. WILLIAMS, *Senior Animal Husbandman, Animal Husbandry Division, Bureau of Animal Industry.*

CONTENTS.

	Page.
Distribution of mules in the United States	1
Advantages of the mule as a work animal	2
Some peculiarities of the mule	2
Production of mules	4
Selecting the jack	4
Care of the jack	5
Feeds for the jack	6
The brood mare	6
Breeding the mare	8
Care of the pregnant mare	9
Care of mare at foaling time	10
Care of mare and foal	10
Production of mules—Continued.	
Weaning the colt	11
The orphan foal	12
Spring or fall colts	13
Educating the colt	13
Feeding and care of mules	13
Judging mules	14
Market classes of mules	17
Draft mules	19
Farm mules	19
Sugar mules	27
Cotton mules	27
Mining mules	27

DISTRIBUTION OF MULES IN THE UNITED STATES.

THE IMPORTANCE and popularity of the mule as a work animal is attested by the greatly increased use of the animal in farm operations. In 1910 the number of mules on farms and ranches was 4,209,769. The number on January 1, 1920, was 5,432,391, an increase, during the decade, of 1,222,622, or nearly 30 per cent. Census figures for the number of mules on farms in the United States January 1, 1925, show the total as 5,730,608, an increase of 298,217 over the 1920 total, or approximately 5 per cent. Of the 5,730,608 mules on farms in 1925, 3,350,756, or 58 per cent, are in the nine Cotton Belt States, which in number of mules rank as follows:

Texas	1,022,978
Oklahoma	368,547
Arkansas	338,852
Georgia	337,984
Mississippi	330,080
Alabama	300,778
North Carolina	278,611
South Carolina	199,283
Louisiana	173,643
Total	3,350,756

The only States outside the Cotton Belt having more than 170,000 head of mules are Missouri, with 390,052, Tennessee 351,784, Kentucky 301,098, and Kansas 259,939. The total number of horses in the Cotton Belt States on January 1, 1925, was 2,239,367, or about 66 per cent as many horses as mules. The only Cotton Belt State having more horses than mules is Oklahoma.

[1] In the preparation of this bulletin the writer is indebted for helpful suggestions and assistance from G. A. Bell, horse-breeding expert in the Remount Service, War Department, and R. S. Whitfield, a former employee of the Animal Husbandry Division.

ADVANTAGES OF THE MULE AS A WORK ANIMAL.

The mule is a hardy work animal. While this humble creature responds to good treatment and gives best service under favorable conditions of feeding and management, it is his ability to endure hardship and to perform sterling service under adverse conditions that has established him so firmly in American agriculture. Those who are stanch supporters of the mule say that, in comparison with the horse, he will live longer, endure more work and hardship, require less attention and feed, is less liable to digestive disorders, lameness, and disease, is more easily handled in large numbers, is less irritable, and is more capable of performing work in the hands of a mediocre or poor horseman. Whether or not all these claims may be

FIG. 1.—A pair of farm mules.

substantiated, it is a fact that the mule is well established as a work animal in those sections where climatic conditions are most severe, feed less abundant, and horsemanship is not a prevailing art (Fig. 1).

SOME PECULIARITIES OF THE MULE.

The mule is an animal with possibly more eccentricities and undeniable virtues than any other domestic animal. One would naturally expect from his heritage a rather unusual temperament requiring the most thoughtful treatment. The difficulty is to know how to handle the mule in order to keep the desirable qualities of his maternal ancestry in the foreground and to keep subservient the latent donkey characteristics. To treat consistently a conglomeration of stubbornness and willingness, temper and sullenness, contentment and restlessness, slyness and docility, faithfulness and waywardness, with no knowledge of which virtue or vice is going to assert itself next, is

a problem which may well tax the qualities of the best horseman. Yet the virtues of the mule have been so evident in times of peace and war that many ardent horse lovers who have been prejudiced against him have come to admire the animal which has no "pride of ancestry or hope of posterity" (Fig. 2).

There are some peculiarities which belong to the mule alone. He does not like to be hurried, worried, or cuffed about; to try to force him to do things against his will is practically impossible and only makes matters worse. The mule must be understood and gently but firmly persuaded to do things out of the ordinary. He is naturally suspicious of everybody who comes around him, and it can be readily observed that he never takes his eye off a person near by, and when the ears begin to wag a little the person watched had better

FIG. 2.—Many mules find their way into the U. S. Army. Good, sound mules with quality are required. This illustration shows representative types of "lead" and "wheel" mules in Army service.

be on the lookout. There seems to be a code system of ear signaling among mules that they all understand. A mean mule can deftly handle his hind legs, and his forelegs are not to be ignored. He has been known to handle his "mits" in a clever fashion. The mule seems to have an uncanny way of detecting whether a person is going to treat him harshly or kindly, and his reception is usually in like manner, nor does he forget the person who inflicts harsh treatment.

There is a wrong and a right way to lead a mule. A man who looks at a mule and lugs at his head will never make any progress. The mule will not be pulled. He will usually follow quietly, however, if a man will walk away in the direction he desires to go. Neither can you "bully" mules into going through tight places; they are somewhat like sheep, and if the leader can be induced to go the rest will follow.

Next to satisfying a hearty appetite the height of mule joy is to roll. A mule will roll at every opportunity and often at inopportune times, when he makes the opportunity suit his own convenience. He dislikes mud and water holes in the road, and is what is known as a sure-footed animal.

PRODUCTION OF MULES.

The mule is a hybrid animal having a jackass, commonly called a jack, for a sire and a mare for a dam. When the reverse cross is made and the female ass (or jennet) is bred to a stallion, the off-

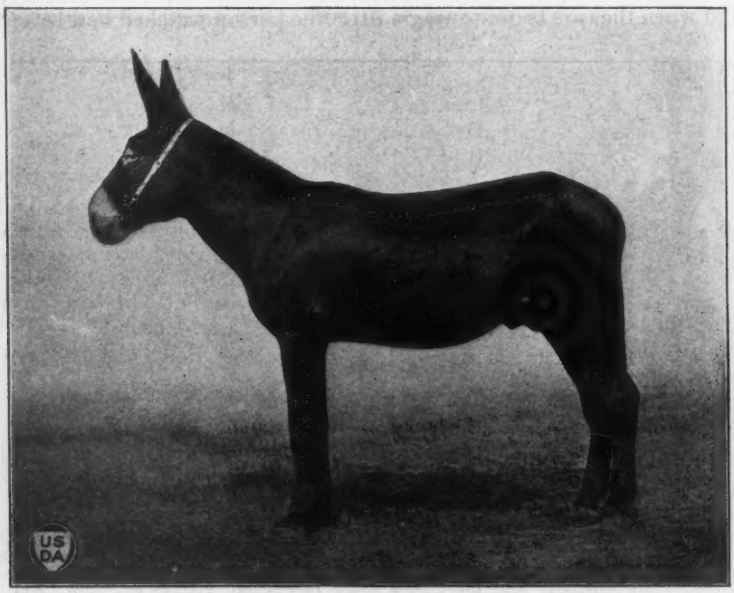


FIG. 3.—A prize-winning jack. Note size of bone and general quality throughout.

spring is called a "hinny." As the mule will not reproduce, it is necessary to maintain both jacks and mares in order to produce mules.

SELECTING THE JACK.

The importation of jacks, and consequently the production of mules, dates back to colonial times. About 1787 George Washington was presented with a jack by the King of Spain, which was used in the stud at Mount Vernon. Many good mules were produced in those days, and the value of the mule as a work animal was soon recognized by intelligent planters. It has been within the last 40 years, however, that the production of mules has been an extensive enterprise and that much attention has been given to the rearing and selection of the best jack stock.

The American jack of to-day is a composite of the bloods of some of the best foreign breeds, and in attaining the highest standard of excellence prevailing in the jack stock of America the breeders have emphasized the valuable utility points so much desired in the best jacks, such as size, weight, bone, style, quality, and action. In America jacks are usually spoken of as jennet jacks and mule jacks. As these terms imply, jennet jacks are used for mating with jennets for the reproduction of the breed, and mule jacks are used for mating with mares for the production of mules.

A good mule jack (Fig. 3) should be not less than 15 hands high and possess plenty of weight, large bone with quality, style, and action. The essential points of conformation in a good jack are a straight, strong back, closely coupled and well muscled over the loin; long and level rump; deep body and spring of rib to allow ample room for lung development. Vigor and strength of constitution are indicated by a broad chest and large heart girth.

The legs should be set straight, be well muscled, and have plenty of bone. The length of leg should be in proportion to depth of body, as height obtained by length of leg is undesirable. The size of the bone is very important and should be ample. The size of the bone is usually determined by measuring the cannon bone about half-way between the knee and the fetlock joint. This circumference should be 8½ inches in a jack of 15 hands' height. It is very desirable to have large, well-shaped feet. The head should be well proportioned, with the profile of the nose straight or slightly roman. The ears should be long, well set, and alert on a mature animal and should measure, horizontally, 33 inches or more in length from tip to tip.

Measurements of a good jack.[1]

[Weight, 1,200 pounds; height (standard measure), 15 hands, 3 inches.]

	Inches.		Inches.
Ears from tip to tip	34	Around body at girth	70
Around face and jaw	39	Around body at loin	67
Around neck at throatlatch	36	Around hoof, below coronet (next to hair)	16½
Around arm	21	Above hock	17½
Around cannon	8½	Below hock	9½
Length from poll to tail	84		

Some of the common defects in jacks which should be avoided are: Flat, narrow chest, which indicates a weak constitution and lack of vigor; light-muscled loin and long coupling; short, drooping rump; excessive length of leg; small feet with contracted heels; and short or droopy ears.

CARE OF THE JACK.

The proper care and management of the jack are somewhat exacting, as he is rather peculiar in his likes and dislikes. While a stallion may be spoiled because of his nervous temperament, the jack may be just as quickly spoiled because of his inclination to be sluggish. The jack should have a caretaker who understands jack man-

[1] Twice champion at the Missouri State Fair and reserve champion at the World's Fair, San Francisco.

agement thoroughly. This is very important, as the disposition of the jack is partly controlled by the groom. The jack should be quietly but firmly handled, as a bad disposition in a jack is usually attributable to harsh handling or mismanagement of the animal when young. Through continuous observation the groom should learn the peculiar individuality of the jack and the little things required for his proper management.

Abundant exercise is one of the big factors in the management of a breeding animal. A roomy, well-ventilated, and well-lighted box stall opening to an exercising paddock is necessary for the proper care of the jack. It is important that the exercising paddock be of good size. In order to insure plenty of exercise, however, it is well to give the jack some road work.

A young jack intended for siring mules should not be permitted to run with jennets or mules, as this practice usually leads to difficulty in teaching him to serve mares, when used in the stud. Instead the young jack should have fillies or gentle mares for companions. The jack may begin serving mares at the age of 2 or 2½ years, but he should not serve more than one mare a day during his first season nor more than 30 for the entire season. A mature jack may serve as many as two mares in a single day provided the two services are several hours apart. The number of mares a jack should serve during a season depends on the strength and vigor of the individual, but 70 or 80 mares probably is the maximum number that he can serve with satisfactory results. Artificial breeding may be employed if the jack is patronized very heavily. This not only conserves the vitality of the jack but also enables the owner to breed a much larger number of mares. If care and precaution are taken, artificial breeding may be practiced with as much success as breeding in the natural way. In fact, some mares which do not conceive from natural service are successfully impregnated artificially. It is sometimes advisable to use a stallion for teasing purposes in order to conserve the jack when the patronage is heavy.

FEEDS FOR THE JACK.

The jack is a rather sluggish animal, and for this reason his feeds should be slightly laxative in character. Bran, oats, crushed barley, and oil meal are splendid grain feeds to use. Sheaf oats and green feeds are also very satisfactory. Corn should be used only in limited amounts. Many jack breeders obtain good results by feeding sheaf oats, clover, and alfalfa hay.

THE BROOD MARE.

Sound brood mares of good quality should be selected in order to be successful in producing high-grade mules. Considerable effort is usually expended by the breeders of work horses in selecting good mares for breeding purposes, but no consistent effort is usually made by the mule breeder in exercising the same care in selecting brood mares for the production of mules. The idea seems to prevail that

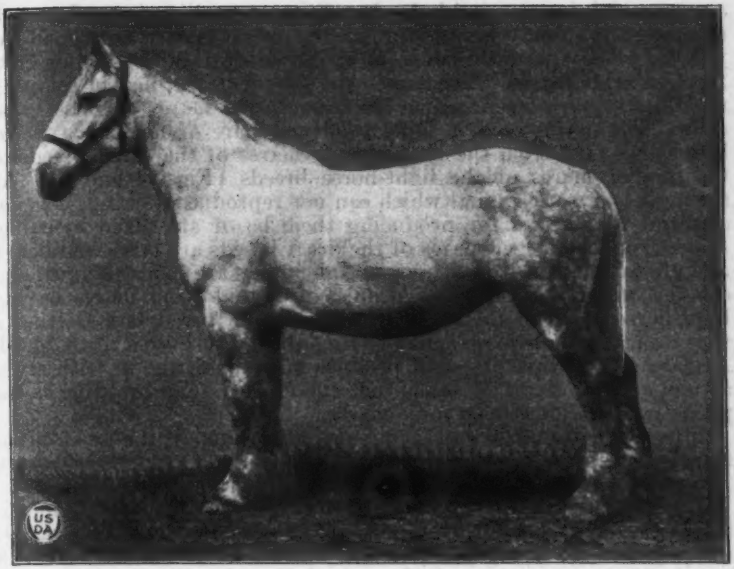


FIG. 4.—A desirable type of brood mare for producing draft mules. Note the "breediness," substance, and conformation of this mare.

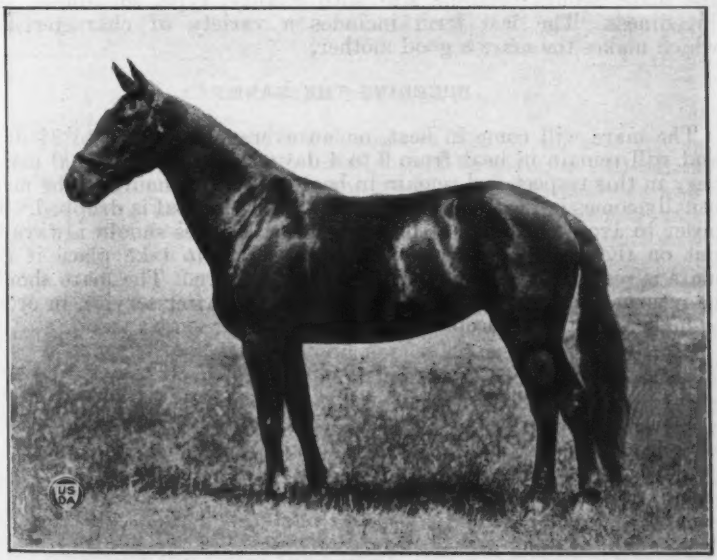


FIG. 5.—A desirable type of light "mule mare" for producing mules of quality. Note roominess of body, short back, depth of heart girth, and "breediness" of this mare.

a mare which is not suitable for breeding to a stallion is good enough to produce a mule. This is a mistake, for no matter how good the jack may be, it is inconsistent to expect uniformly good mule colts from inferior mares. The same care should be applied in selecting mule mares as is exercised in selecting brood mares to raise horse colts. The mares used in mule production are of no fixed type or breed and vary from the large, heavy mares of the draft breeds to the smaller mares of the light-horse breeds (Figs. 4 and 5). As the mule is a work animal which can not reproduce its kind, it is not essential that mares for producing them be of any fixed breeding. Mules from the larger mares of the draft breeds are large and heavy and are excellent for draft purposes, but they are more sluggish and can not stand heat so well as mules produced from mares having light-horse blood in their veins. Experienced breeders state that a very desirable mule mare is one having about one-fourth draft blood. A mare of this breeding will produce good-sized mules, with style, action, and stamina. It seems that type rather than breeding is the prime requisite of a good mule mare.

In conformation the mule mare should possess all the good qualities desired in the brood mare used for producing good work horses. Some of the most important points of the good mule mare are:

A broad chest and large heart girth, indicating a vigorous constitution; a roomy barrel to allow for full development of the fetus; a straight back, strongly muscled over the loins; well-set legs with broad, flat bone, sound and of good quality; large and well-shaped feet; and feminine character, indicating "breediness." To sum up, the mare should combine size with quality, type, soundness, and breediness. The last term includes a variety of characteristics which makes the mare a good mother.

BREEDING THE MARE.

The mare will come in heat, on an average, every 18 to 21 days and will remain in heat from 2 to 4 days, though exceptional mares vary in this respect and remain in heat only a few hours. The mare usually comes in heat on the ninth day after the foal is dropped. In order to avoid accidents at breeding time, hobbles should always be put on the mare. Conception is more likely to take place if the mare is rested for a few hours at time of service. The mare should be returned to the jack in from 18 to 21 days after service, in order to make sure that conception has taken place.

TABLE 1.—*Calendar showing time of service and date of foaling based on 340-day gestation period for mares.*

Day of month mare is bred.	Date of foaling.											
	Bred in Jan.	Bred in Feb.	Bred in Mar.	Bred in Apr.	Bred in May.	Bred in June.	Bred in July.	Bred in Aug.	Bred in Sept.	Bred in Oct.	Bred in Nov.	Bred in Dec.
	Dec.	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May.*	*June.*	*July.*	*Aug.*	*Sept.*	*Oct.*	*Nov.*
1	6	6	3	6	5	6	5	6	6	5	6	5
2	7	7	4	7	6	7	6	7	7	6	7	6
3	8	8	5	8	7	8	7	8	8	7	8	7
4	9	9	6	9	8	9	8	9	9	8	9	8
5	10	10	7	10	9	10	9	10	10	9	10	9
6	11	11	8	11	10	11	10	11	11	10	11	10
7	12	12	9	12	11	12	11	12	12	11	12	11
8	13	13	10	13	12	13	12	13	13	12	13	12
9	14	14	11	14	13	14	13	14	14	13	14	13
10	15	15	12	15	14	15	14	15	15	14	15	14
11	16	16	13	16	15	16	15	16	16	15	16	15
12	17	17	14	17	16	17	16	17	17	16	17	16
13	18	18	15	18	17	18	17	18	18	17	18	17
14	19	19	16	19	18	19	18	19	19	18	19	18
15	20	20	17	20	19	20	19	20	20	19	20	19
16	21	21	18	21	20	21	20	21	21	20	21	20
17	22	22	19	22	21	22	21	22	22	21	22	21
18	23	23	20	23	22	23	22	23	23	22	23	22
19	24	24	21	24	23	24	23	24	24	23	24	23
20	25	25	22	25	24	25	24	25	25	24	25	24
21	26	26	23	26	25	26	25	26	26	25	26	25
22	27	27	24	27	26	27	26	27	27	26	27	26
23	28	28	25	28	27	28	27	28	28	27	28	27
24	29	29	26	29	28	29	28	29	29	28	29	28
25	30	30	27	30	29	30	29	30	30	29	30	29
26	31	31	28	31	30	31	30	31	31	30	31	30
	Jan.	*Feb.*	*Mar.*	*Apr.*	*May.*	*June.*	*July.*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
27	1	1	1	1	1	1	1	1	1	1	1	1
28	2	2	2	2	2	2	2	2	2	2	2	2
29	3	.....	3	3	3	3	3	3	3	3	3	3
30	4	.....	4	4	4	4	4	4	4	4	4	4
31	5	.....	5	.....	5	.....	5	5	.....	5	.....	5

CARE OF THE PREGNANT MARE.

There should be no sudden changes in feed or work of the mare after she becomes pregnant. She should be given a well-balanced ration of feed that will supply the needs of her own body as well as those of the growing fetus. Feeds that are too fattening should be avoided, also moldy or damaged hay, as there is a suspicion that either may cause abortion. Exercise is a most important essential to the health of the pregnant mare, as well as for the development of a strong, healthy foal. The best and most economical way of giving this exercise is by using the mare in regular farm work. The pregnant brood mare should not be subjected to hard pulls or severe strains. By using care and judgment the mare may be safely worked up to within a week or ten days of foaling. The average gestation period of mares—that is, the length of time that they carry their foals—is about 340 days. This period varies slightly with individual mares. It is important that a careful record be kept of the date of service to the jack in order that the time of foaling may be anticipated. A very sure sign that the foal will be dropped in a short while is the appearance of wax on the teats, which usually appears two or three days before parturition.

CARE OF MARE AT FOALING TIME.

About a week or ten days before the foal is expected the mare should be turned into a pasture or paddock, where there is no danger of injury from other animals. If the weather is mild, a paddock or pasture is a desirable place for the foal to be delivered. There is probably less danger of infection in a pasture than in a stable. If desirable conditions for foaling outside can not be provided for, a roomy box stall that has been well cleaned out, disinfected, and bedded with fresh straw should be provided.

It is well to observe the mare closely when the foal is expected, in order that assistance may be given in delivery if necessary. It will be necessary for the attendant to be where he can see the mare and yet be unseen by her. Should she need assistance, a veterinarian should be summoned at once. If it is essential that aid be given, the service should be rendered by one who has had experience with and understands the many phases of difficult parturition.

If the foal has been delivered satisfactorily, the attendant should remove as soon as possible any tissue or matter that may be clogging its nostrils and see that respiration is started. Assistance may be rendered in this respect by blowing into the foal's nostrils and rubbing its sides with a cloth or wisp of straw. As soon as practicable, without disturbing the mare unnecessarily, remove the afterbirth from the proximity of the mare and, if foaling occurred in a stable, clean out the bedding that has been soiled during parturition, sprinkle lime on the floor where the bedding has been removed, and supply fresh bedding.

To prevent infection, the navel cord of the foal should be saturated with full-strength tincture of iodin or a solution of 1 to 1,000 corrosive sublimate, and then dusted with powdered slaked lime. This should be repeated each day until the navel cord drops off. A normal foal will usually find its own way to the mare's udder soon after arrival. If, however, the foal is weak and unable to stand within two or three hours after birth, it should be assisted in getting its first meal. It is very important that the newborn foal get the first milk from its dam, which is a substance called colostrum. In addition to having the food properties so much needed by the new born, the colostrum also has a purgative effect, which stimulates the action of the digestive tract in eliminating the fecal matter already collected during the period of gestation. If this fecal matter is not eliminated within 24 hours after the colt is born, a dose of castor oil (2 to 4 tablespoons) shaken well in milk should be given and repeated in three or four hours until the desired results are obtained.

CARE OF MARE AND FOAL.

The mare should receive bran mashes and light feeds until she has recovered from the effects of foaling and the feverish condition of her system has disappeared. The ration should then be increased gradually until the mare is on full feed.

When the weather is warm and pleasant, the mare and foal may be turned out on pasture or paddock as soon as the foal is able to follow, as exercise is very beneficial and they will thrive better in the open.

If the mare was being worked prior to foaling, she will be ready for work again in 10 days or two weeks after the colt is born. When this is done the colt should be confined in a stable or paddock and not permitted to follow in the fields. The mare and colt will fret for each other for a while, but they will soon become accustomed to separation. When working, the mare should be returned to the stable once in the forenoon and in the midafternoon to allow the colt to suckle. The mare should be allowed to cool before being turned in with the colt, as there is danger of causing the colt to have scours and other digestive troubles if the mare is overheated when nursing.

When the mare is idle during the fly season, it is best to keep her and her foal in a darkened stable in the day and turn them out on pasture at night. The mare should be fed some grain and hay, as grass alone will not supply the needs of her body and also provide a sufficient milk flow for the colt.

The colt usually begins to eat a small amount of grain at the age of three or four weeks. Oatmeal should be the first grain fed and bran may be added later. Best results in feeding grain to colts in the open are obtained by building a creep under which they may pass at all times and which will prevent the mares or other mature horses from reaching the feed provided for the colts. The colt will eat only a little grain at first, but it is worth much to have it begin eating a small amount as soon as possible, because the more accustomed it becomes to eating grain while young the less trouble there will be at weaning time. The mare may be induced to frequent the creep by giving her an occasional feed near there also.

WEANING THE COLT.

Under ordinary conditions the colt is usually weaned when about six months old, but if the mare is working and the colt is thrifty it may be weaned earlier. When the colt has been taught to eat grain early, this separation from its dam need not cause any check in the colt's development. This is a trying time in the life of a colt, however, and it should receive additional feed and care to make up for the loss of the mother's milk from its ration. When the colt is once taken away from the mare, the separation should be made complete.

The mare requires some individual attention at weaning time. It will be necessary to milk her by hand for a few days to prevent too much milk from collecting in the udder and causing it to become caked and swollen. To assist in the drying-up process, the mare should be milked only partially dry and if the milk flow is maintained the grain ration should be reduced for a few days.

CARE OF THE COLT AFTER WEANING.

At no time in the colt's life is pasture more important than at the time of weaning. On being taken away from its dam, the colt needs succulent feed and the best way of supplying this feed is by having a good pasture. Not only is a good pasture necessary for the development of the colt, but it is also necessary if the colt is to be raised in an economical manner. In addition to the pasture the colt should

receive liberal amounts of grain and hay. Half of its growth is made during its first year and it should have every advantage possible for its development. Colts like companionship and they do better if several are allowed to run together (Fig. 6).

THE ORPHAN COLT.

It may happen sometimes that the mare dies soon after foaling or fails to give milk enough for her foal. When either of these misfortunes occurs the colt must be raised by hand, which is a tedious undertaking but is worth while if done properly. As a feed for the orphan colt, the best and most practical substitute for mare's milk is cow's milk after it has been prepared to conform as nearly as possible

FIG. 6.—Mule foals like companionship. A group of weanlings on pasture.

in composition to the milk of the mare. This is done by selecting milk that is low in butterfat and diluting it with one part of fresh water for three parts of milk. Add a tablespoon of sugar and three or four tablespoons of limewater to a pint of this diluted milk and heat to body temperature. Give the foal about a half teacup of this prepared milk at first and at short intervals gradually increase the amount and the length of time between feeding periods as the foal develops. A bottle with a rubber nipple attached is the most convenient way to give milk to the orphan. As the foal suckles frequently in small amounts when following its dam, one should feed it frequently and thus conform as nearly to natural conditions as possible.

The utensils used in feeding the orphan foal should be kept scrupulously clean. This can be done by freely utilizing hot water and sunshine, both of which are enemies to germs that collect and thrive in milk containers.

SPRING OR FALL COLTS.

The climatic conditions and nature of the farm work determine largely whether it is best to have the colts come in the spring or in the fall.

The natural breeding season for mares is in the spring, which is the generally accepted time to have colts. There are, however, several advantages of having fall colts, especially in the South. The fall-born colt comes at a time when the mare can probably be more easily spared from farm work and at a time when flies are not so abundant. Another advantage is that the fall colt is weaned at a time when it can be turned on to pasture and its development is not retarded at this critical time. The spring colt is weaned at a time when the grazing season is practically over.

EDUCATING THE COLT.

The time to begin the education of the colt is early in its life. It should be halterbroken and taught to be led when a few weeks old. The more the colt is handled when young the fewer difficulties will be encountered later when it is desired to put him to work.

Mules reach maturity at the age of 5 years, but they may be given light work when 3 years old. Care should be taken not to overload young mules. Overtaxing the young animal not only tends to check its development but also causes it to become unreliable as a worker, and possibly balky. A young mule that becomes accustomed to moving a load every time it is called upon will develop into a reliable work animal.

FEEDING AND CARE OF MULES.

Too little thought and attention are usually given to the proper methods of management and feeding of mules. Where the use of mules as work stock prevails, the feeding is usually done in a haphazard manner without regard to efficiency and economy. The essentials of a good caretaker are judgment and common sense combined with some knowledge of feeds. The most practical feeds to use are those which are grown on the farm or plantation so far as they provide the essential nutrients for a balanced ration. Corn, oats, and barley are the most widely used grains, as there is hardly a section of the United States where one or more of these grains are not grown. These grains may be combined to make a satisfactory feed or taken singly and supplemented with such feeds as bran, oil meal, or cottonseed meal to make a balanced ration. A balanced ration is one which will supply the protein and carbohydrate elements in such proportion as to meet as nearly as possible the body requirements of the animal for doing the work which it is to perform.[2] The same principles that are used in the correct feeding of horses may also be applied to the feeding of mules. As a general rule 1.1 pounds of grain and 1¼ pounds of hay daily per 100 pounds of live weight will be found to be about the right amount of feed to use for an animal at medium work. The exact

[2] Methods of computing a balanced ration are fully explained in Farmers' Bulletin 1030, Feeding Horses, which may be obtained on request from the Division of Publications, Department of Agriculture, Washington, D. C.

quantity of feed depends upon the individual animal and must be determined by the feeder.

While there are many cases in which mules are underfed, there are probably many others in which the owner suffers financially because the mules are fed more high-priced feeds than they really need, through the use of improperly balanced rations. Overfeeding is most likely to be done during the winter months, when the mules are idle. During this period idle mules may be kept in good condition largely on hay and straw and a small amount of grain. Mules that are worked hard and are receiving heavy rations should have their feed allowance diminished when idle. Idle mules thrive better if they are not confined in stables but are kept in the open.

Digestive disorders are more prevalent among work stock during the spring and summer months than at any other time. This is due to the improper feeding and watering of overheated animals. If the work animal appears to be excessively warm when brought in from work, it should be permitted to cool off before watering or feeding. Attention to such details will prevent many cases of colic. Mules sometimes suffer in hot weather from heat because they are allowed to eat too much grain or hay. This is most likely to occur when fresh, new hay is being fed. The hay ration should be fed mainly at night so that there will be several hours in which the mule may partly digest and assimilate this bulky feed before going to work.

Mules like to roll after being unharnessed, and they should have a place where they may rest themselves in this way. They will be much more comfortable in summer if they are turned out of their stables at night after they have cleaned up their feed. If they are turned on to pasture at night they will sweat more the next day, but the beneficial effects obtained from the grass and being in the open will more than offset the effects of excessive sweating. If unable to provide pasture for the mules at night during the summer, a paddock or lot should be provided where they may be comfortable.

JUDGING MULES.

The general form and appearance of the mule should resemble closely that of a horse, and in judging mules the same general points of perfection are looked for. The nearer the mule approaches the ideal desired in a draft horse the more valuable he is from a market standpoint. In the mule there are certain characteristics derived from his paternal side which are mainly indicated in his bray, disposition, ears, tail, and feet, aside from which the mule does not differ materially from the dam.

Mules vary in height from the little 12-hand pit mules to the large draft mules standing 17½ hands. The range in height of various classes of mules is given in another portion of this bulletin under "Market classes of mules."

The weight of mules varies from 600 pounds to 1,600 pounds. The average weight of the larger type of mules varies between 1,150 and 1,400 pounds and is the range of weight within which the majority of the most marketable mules are classified.

The form of the mule should be compact, with a deep body, broad chest, full flanks, short back, and well-sprung ribs. Light, waspy flanks, long narrow bodies, and long backs are not desirable.

Quality is rather difficult to define, but is that which every capable judge looks for in any animal. It is indicated in a mule by a trim, fine ear, clean-cut head and joints, flinty flat bone, well-defined tendons, and soft, silky hair. Quality marks the difference between a "market topper" and a "jar head." A short, thick ear, a coarse head, round, spongy bone, and a harsh coat of hair are indications which the judge should discriminate against.

The natural tendency of the mule is to be lazy and obstinate. An active, energetic mule is much desired.

It is in the hind quarters of the mule that the greatest faults of conformation are usually found. The croup is often very short

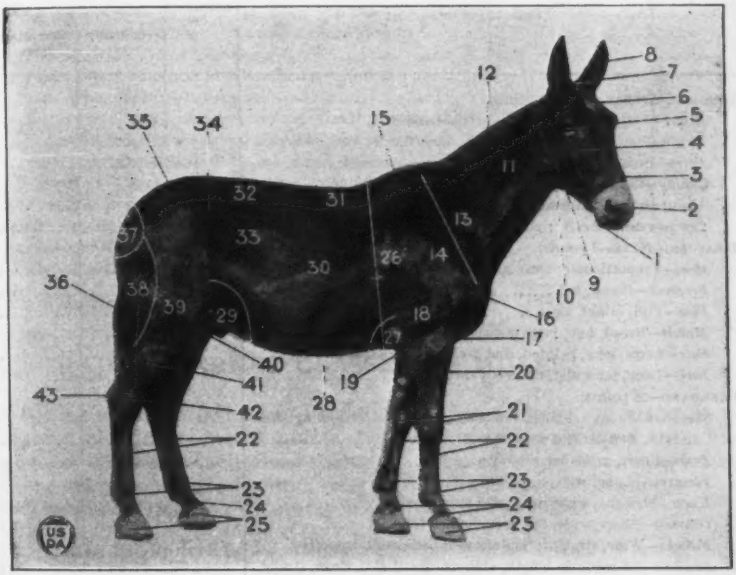


FIG. 7.—The points of the mule: 1, mouth; 2, nostril; 3, nose; 4, face; 5, eye; 6, forehead; 7, poll; 8, ear; 9, lower jaw; 10, throatlatch; 11, neck; 12, crest; 13, shoulder bed; 14, shoulder; 15, withers; 16, point of shoulder; 17, breast; 18, arm; 19, elbow; 20, forearm; 21, knees; 22, cannons; 23, fetlocks; 24, pasterns; 25, feet; 26, heart girth; 27, fore flank; 28, underline; 29, hind flank; 30, barrel; 31, back; 32, loin; 33, coupling; 34, hip; 35, croup; 36, tail; 37, buttock; 38, quarters; 39, thigh; 40, stifle; 41, gaskin; 42, hock; 43, point of hock.

and steep, the hips sloping, the thighs narrow, and the hind legs sickle shaped. These are faults of conformation that judges should discriminate against sharply. It is in the hind quarters and loins that the draft animal obtains propelling power. These portions of the animal, therefore, should be correctly built and properly developed. The loins should be broad, short, and thickly muscled; the croup long and level; the hips long, level, and muscular; the thighs thick,

long, and well muscled; and the hind legs well set, with broad, clean-cut hocks and flat, dense bone. The mule should stand on good feet that are well shaped.

While the mule is essentially a draft animal, it is used widely for general utility purposes, especially in the South. Though style and action may not be so important qualities in a mule as they are in the lighter breeds of horses, these qualities add materially to its value. A smart, alert mule, with a long, free stride at the walk and a snappy, balanced trot is highly desired. Figure 7 and the accompanying score card give points in the study of conformation.

Score Card for the Mule.

Scale of points.	Standard score.	Points given animal judged.	
		Student's score.	Corrected score.
GENERAL APPEARANCE—16 points:			
Height—Estimated hands....; actual hands.....			
Weight—Estimated....; actual....; according to age and type....	4		
Form—Broad, deep, compact, smooth, symmetrical	4		
Quality—Clean, dense bone with sufficient substance; refined head and ears; fine hair; defined joints and tendons	4		
Temperament—Active; good disposition	4		
HEAD AND NECK—7 points:			
Head—Proportionate; clear-cut features	1		
Forehead—Broad, full	1		
Eyes—Full, bright, clear	1		
Muzzle—Broad, fine; large nostrils; trim and even lips	1		
Ears—Large, long, pointed, fine, well set, carried alert	1		
Neck—Long, muscular, clean-cut throatlatch	2		
FOREHAND—24 points:			
Shoulders—Long, sloping, smooth, muscular, blending into smooth, well-defined withers	3		
Arms—Short, muscular, elbow in	1		
Forearms—Long, wide, muscular	2		
Knees—Straight, wide, deep, well supported	2		
Cannons—Short, wide, flat, well-defined tendons	2		
Fetlocks—Wide, straight, tendons well back, well supported	1		
Pasterns—Of medium length, oblique (about 45°), clean, strong	3		
Feet—Of medium size, set straight; dense, smooth horn; slope of wall parallel to pastern; wide, high heels; concave sole; strong bars; prominent, elastic frog	6		
Leg position—In front, a perpendicular line from point of shoulder should divide the leg and foot into lateral halves; from the side, a similar line from the bony prominence on shoulder blade should pass through the center of elbow, knee, and pastern joints, and meet the ground back of foot	4		
BODY—9 points:			
Chest—Deep, wide	2		
Ribs—Long, well sprung, close	2		
Back—Short, broad, strong	2		
Loin—Short, wide, muscular	2		
Flanks—Deep, full; long, low underline	1		

Score Card for the Mule—Continued.

Scale of points.	Standard score.	Points given animal judged.	
		Student's score.	Corrected score.
HIND QUARTERS—32 points:			
Hips—Wide, level, smooth, muscular	2		
Croup—Long, level, muscular	2		
Tail—Set high, well carried	1		
Quarters and thighs—Deep and muscular; strongly joined to gaskins	3		
Stifles—Broad, thick, strong	1		
Gaskins—(Lower thighs) long, wide, muscular	2		
Hocks—Straight, wide, prominent points, deep, flat, clean-cut, well supported	6		
Cannons—Similar to front, but a trifle longer and wider	2		
Fetlocks—Wide, straight, tendons well back	2		
Pasterns—Similar to front, but less sloping (about 55°)	3		
Feet—Similar to front, but not quite as large	4		
Leg position—From rear, a perpendicular line from point of buttock should divide the leg and foot into lateral halves; from the side, this same line should touch the point of hock and run parallel to the cannon. A similar line from hip joint should meet the ground midway between heel and toe	4		
ACTION—12 points:			
Walk—Active, straight, balanced, long stride	7		
Trot—Straight, long, free, regular, snappy stride	5		
Total	100		

MARKET CLASSES OF MULES.

Mules are classified according to their use. There are many local market classifications of mules, but they may be grouped into five general classes. Each class includes mules of a general type, while there are various grades and weights within a specific class.

The general classes of mules are shown in the table.

TABLE 2.—*Ranges in height and weight of various classes of mules.*[8]

Class.	Range in height.	Range in weight.
	Hands.	*Pounds.*
Draft	16 to 17½	1,200 to 1,600
Farm	15½ to 16	900 to 1,250
Sugar	16 to 17	1,150 to 1,300
Cotton	13½ to 15½	750 to 1,100
Mining	12 to 16	600 to 1,350

Each of the classes is graded according to conformation, soundness, quality, condition, and action into the following grades: Choice, good, medium, common, inferior.

[8] Market Classes and Grades of Horses and Mules. Bulletin 122, Illinois Agricultural Experiment Station, 2d ed. 1912.

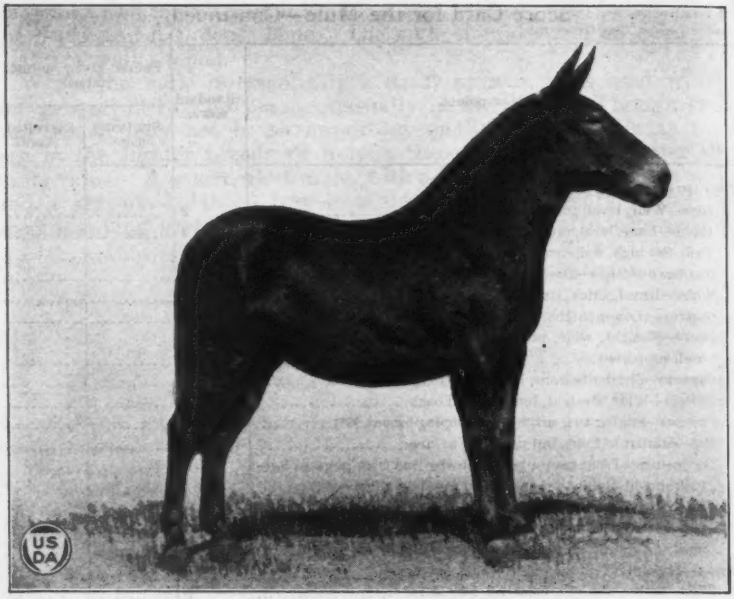


FIG. 8.—A choice draft mule. Champion mule at American Royal Livestock Show, Kansas City, Mo., 1922.

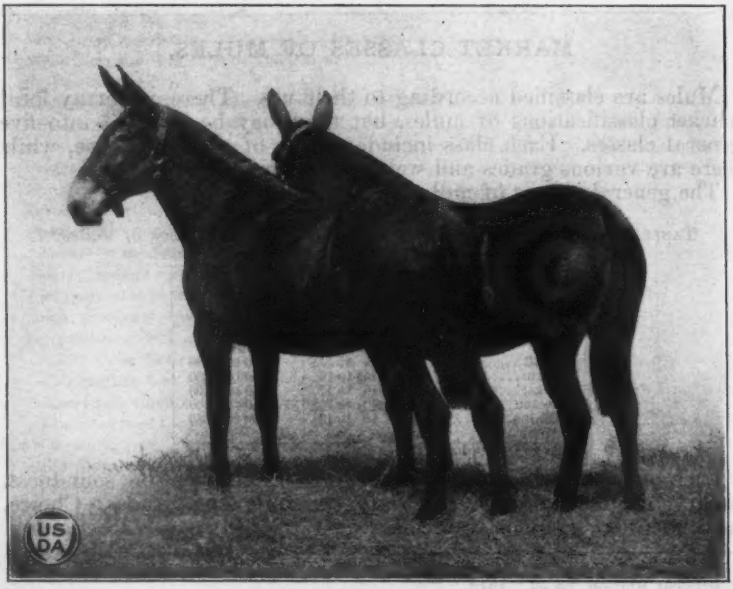


FIG. 9.—A pair of choice draft mules.

DRAFT MULES.

The draft-mule class includes the largest mules (Figs. 8, 9, 10), standing from 16 to 17½ hands and weighing from 1,200 to 1,600 pounds. Some exceptional draft mules exceed the maximum weight given for this class. They are used largely for heavy teaming in large cities, especially in the warmer climates; for contract jobs, such as road grading and railroad work; and for lumber work. Mules for contract work are usually designated by an appropriate descriptive name, such, for instance, as "railroaders." The heaviest draft mules find their way to the lumber camps. Contract mules

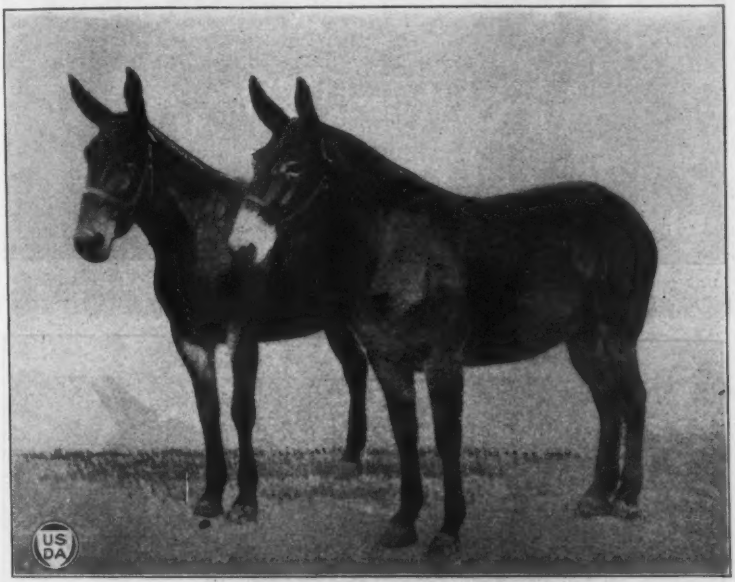


FIG. 10.—A pair of good draft mules.

must have more quality than lumber mules, but extreme weight is not so essential. The greatest demand for draft mules is for those between the ages of 5 and 8 years.

There is no special preference in regard to sex. The highest prices paid are for those mules having weight combined with heavy bone, large, well-shaped feet, strong, short backs, closely coupled with abundant muscling over the loin and hind quarters.

FARM MULES.

Mules purchased in the market for farm work in the Middle Western States are known as "farm mules." There is more variation in quality and type in this class than in any other class, as the demand for a specific type is not so well defined (Figs. 11, 12, 13, 14).

FIG. 11.—A pair of large farm mules.

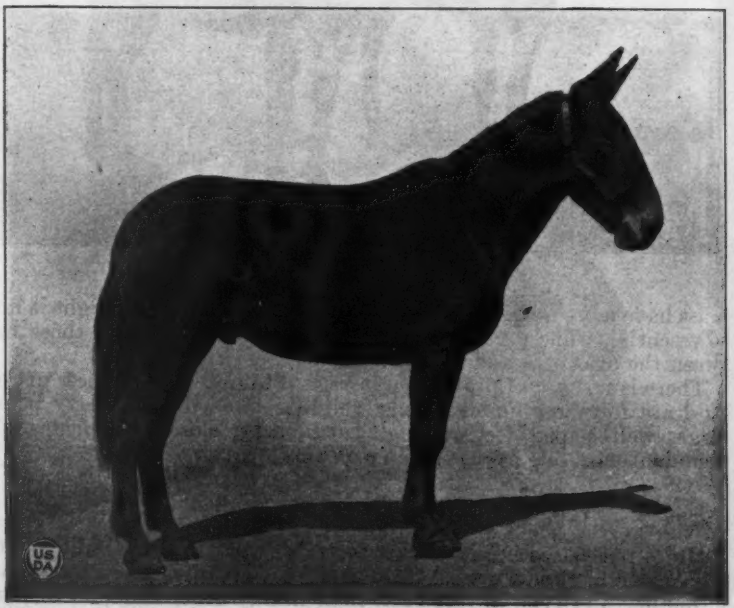


FIG. 12.—A good farm mule.

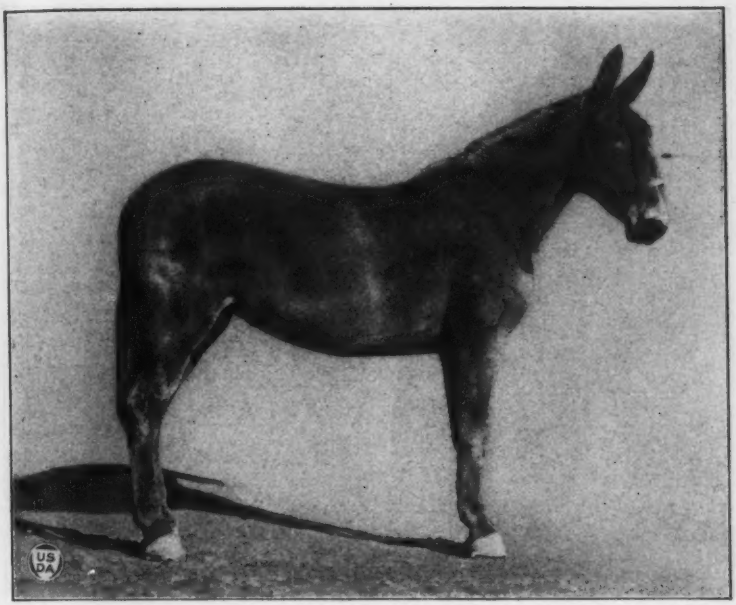


FIG. 13.—A medium farm mule.

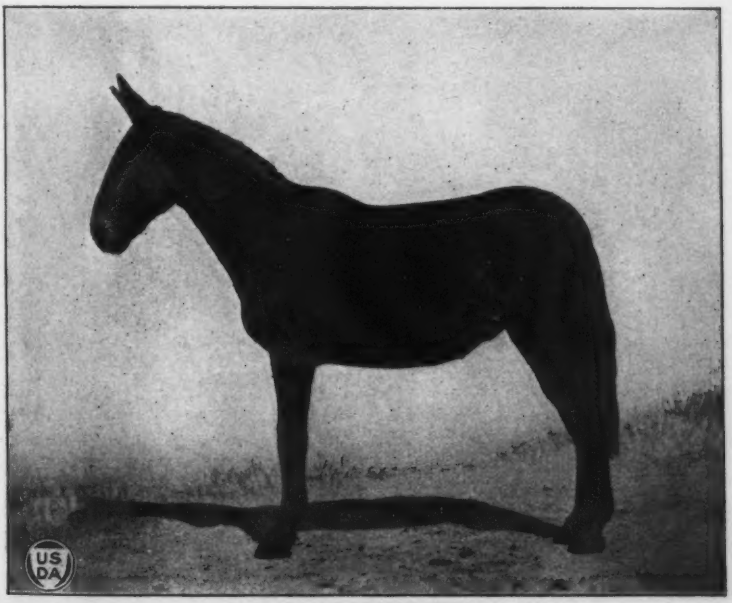


FIG. 14.—Common farm mule.

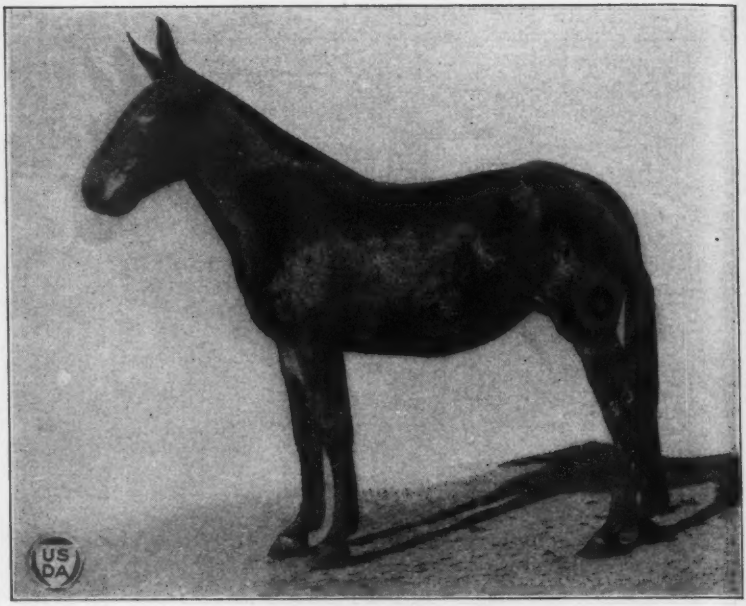


FIG. 15.—A choice sugar mule.

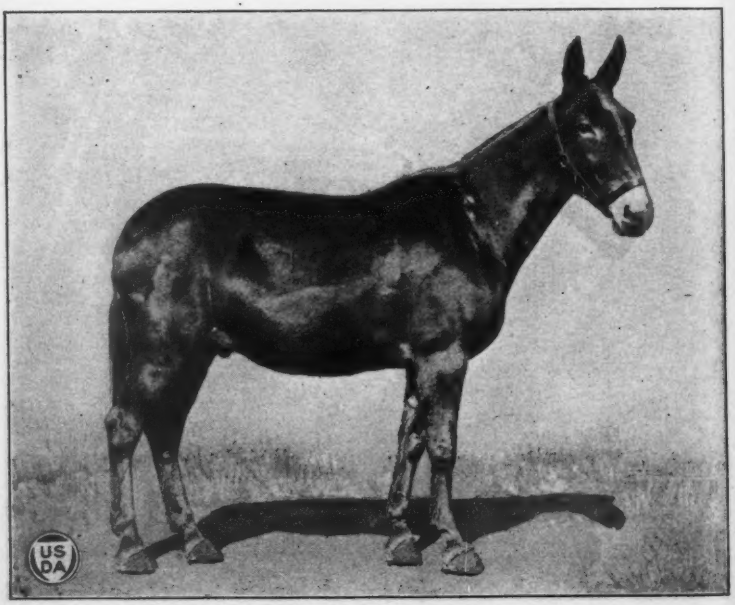


FIG. 16.—A good sugar mule.

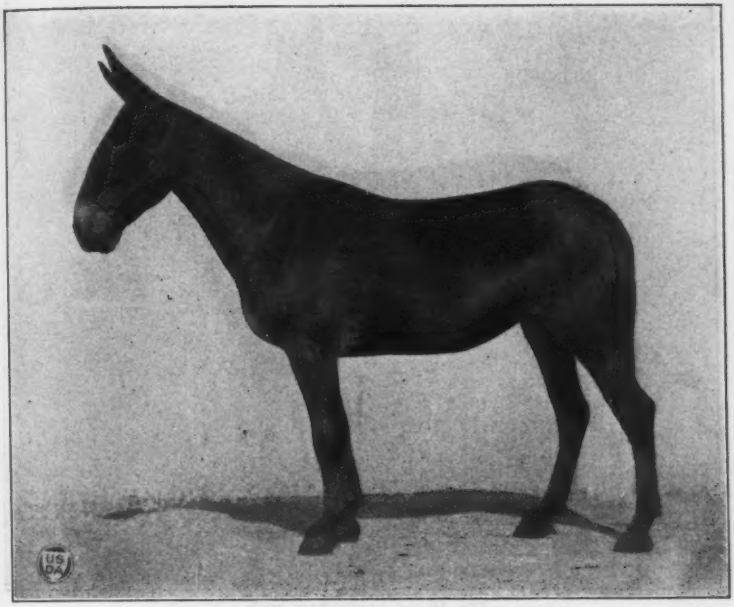


FIG. 17.—Common sugar mule.

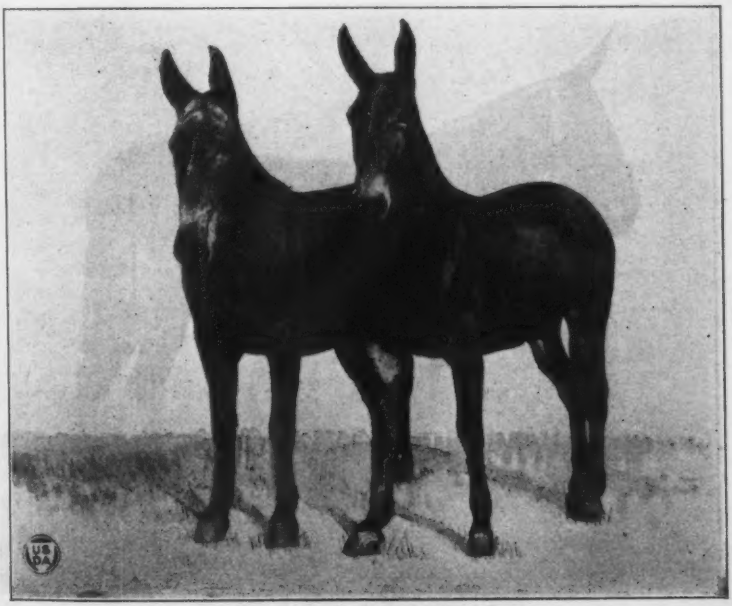


FIG. 18.—A team of choice cotton mules.

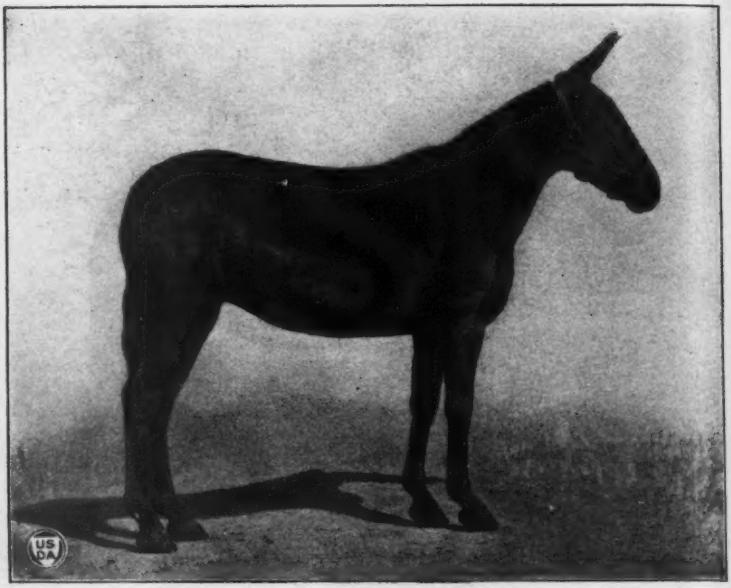


FIG. 19.—A good cotton mule.

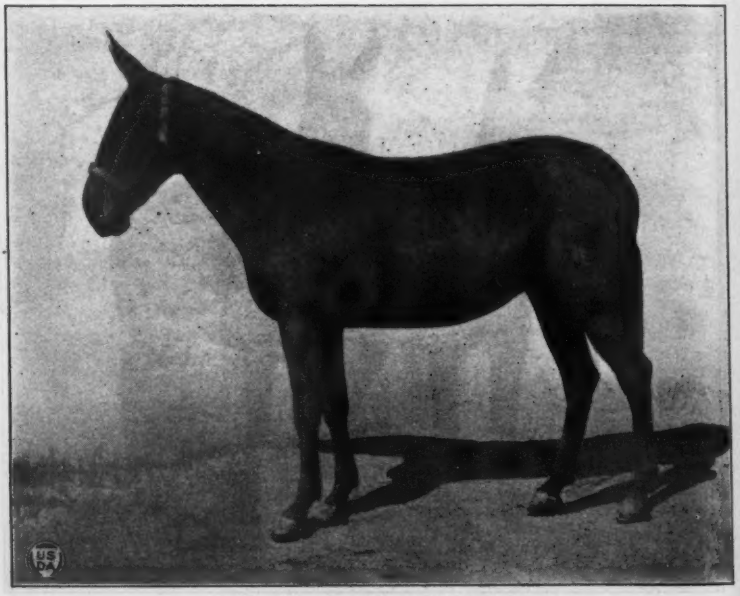


FIG. 20.—A medium cotton mule.

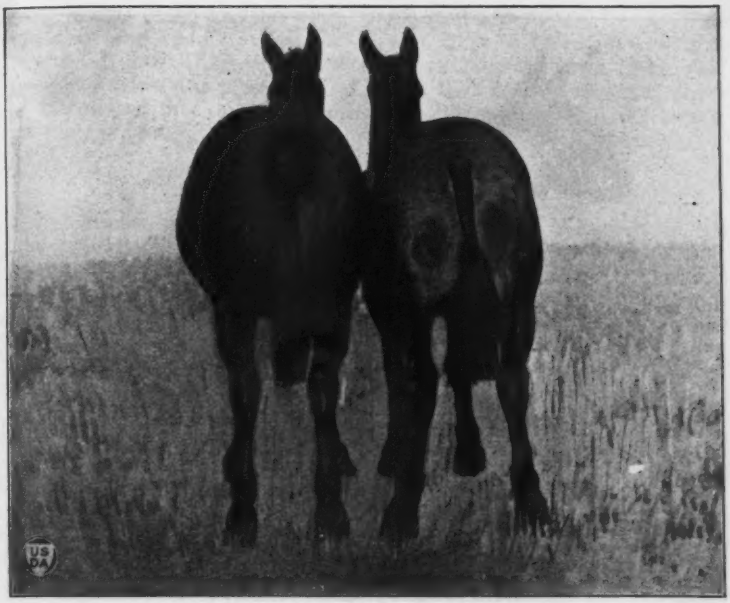


FIG. 21.—A team of choice surface mining mules.

FIG. 22.—A choice surface mining mule.

FIG. 23.—A choice pit mining mule.

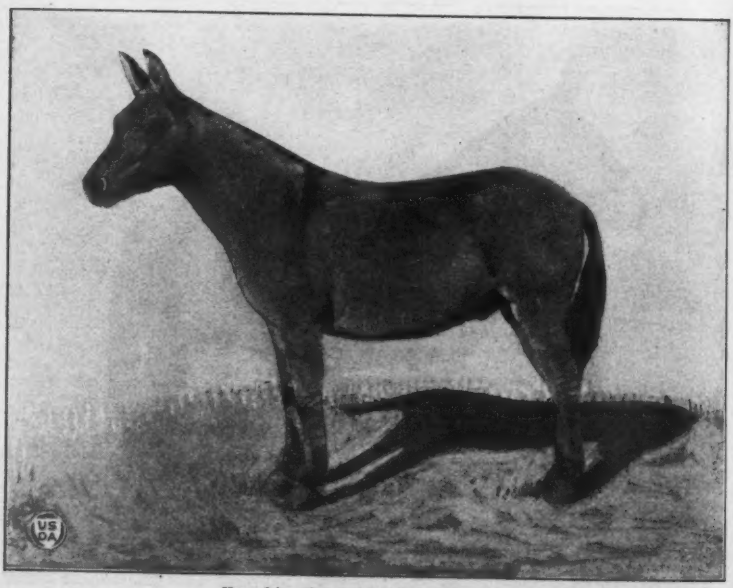


FIG. 24.—A good pit mining mule.

Mules in this class may be plain draft mules or cotton mules that lack finish and condition, as the farmer likes to buy mules with a prospect of developing them into more valuable animals. Many of them are worked for a season and then fitted for the market, where they are placed into one of the other specific classes, such as "drafters," "sugar mules," "cotton mules," "miners," or "railroaders."

SUGAR MULES.

Sugar mules are those which are purchased for shipment to the sugar plantations of the South. This class of mules is somewhat rangy in type and should have quality, style, and finish. The mules in this class are heavier and more compact than cotton mules, but not so heavy as draft mules. The range in weight is from 1,150 to 1,300 pounds. In selecting sugar mules special attention should be given to quality and adaptability to the work. The feet should be large and well shaped. Mare mules are preferred for the sugar trade (Figs. 15, 16, 17).

COTTON MULES.

As the name implies, cotton mules are purchased for cotton plantations. The type (Figs. 18, 19, 20) is somewhat lighter and more angular than the sugar or surface-mining mule and heavier than the pit mule. While there is a gradation of quality and age in this market class, the planters of the South are becoming more and more inclined to increased weight and quality in their mules than prevailed a few years ago. A choice cotton mule weighs about 1,150 pounds and is alert and active, but most mules in this class vary from 750 to 1,100 pounds. The custom in the Cotton Belt is to buy mules in the spring for the crop season and dispose of them in the fall. As they are usually in poor condition following the heavy summer's work, they are sold in the fall for a fraction of the purchase price. These mules are wintered, fattened, and sold back to the planter in the spring. For this reason the age limits within this class are variable. Mules from 5 to 7 years old are preferred, however, for this trade and bring the best prices.

MINING MULES.

There is a wide range in weight among mining mules, varying from 600-pound pit mules to 1,350-pound surface mules (Figs. 21, 22, 23, 24). Good feet and freedom from blemishes are requirements for mules to qualify for top prices for the mining trade.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE.

April 27, 1926.

Secretary of Agriculture	W. M. JARDINE.
Assistant Secretary	R. W. DUNLAP.
Director of Scientific Work	
Director of Regulatory Work	WALTER G. CAMPBELL.
Director of Extension Work	C. W. WARBURTON.
Director of Information	NELSON ANTRIM CRAWFORD.
Director of Personnel and Business Administration	W. W. STOCKBERGER.
Solicitor	R. W. WILLIAMS.
Weather Bureau	CHARLES F. MARVIN, *Chief.*
Bureau of Agricultural Economics	THOMAS P. COOPER, *Chief.*
Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Bureau of Plant Industry	WILLIAM A. TAYLOR, *Chief.*
Forest Service	W. B. GREELEY, *Chief.*
Bureau of Chemistry	C. A. BROWNE, *Chief.*
Bureau of Soils	MILTON WHITNEY, *Chief.*
Bureau of Entomology	L. O. HOWARD, *Chief.*
Bureau of Biological Survey	E. W. NELSON, *Chief.*
Bureau of Public Roads	THOMAS H. MACDONALD, *Chief.*
Bureau of Home Economics	LOUISE STANLEY, *Chief.*
Bureau of Dairying	C. W. LARSON, *Chief.*
Fixed Nitrogen Research Laboratory	F. G. COTTRELL, *Director.*
Office of Experiment Stations	E. W. ALLEN, *Chief.*
Office of Cooperative Extension Work	C. B. SMITH, *Chief.*
Library	CLARIBEL R. BARNETT, *Librarian.*
Federal Horticultural Board	C. L. MARLATT, *Chairman.*
Insecticide and Fungicide Board	J. K. HAYWOOD, *Chairman.*
Packers and Stockyards Administration	JOHN T. CAINE III, *in Charge.*
Grain Futures Administration	J. W. T. DUVEL, *in Charge.*

This bulletin is a contribution from

Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Animal Husbandry Division	E. W. SHEETS, *Chief.*

28

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
5 CENTS PER COPY
V

WASHINGTON : GOVERNMENT PRINTING OFFICE : 1926

U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1341 rev. May 1927

Rev.ed. follows

MULE PRODUCTION

THE ABILITY of the mule to endure hardship and perform sterling service under adverse conditions has established him as a real asset in American agriculture.

The mule will give best service under favorable conditions of feeding and management.

Good, sound mares should be selected for breeding in order to be successful in producing high-grade mules. A very desirable "mule mare" is one having about one-fourth draft blood.

The most practical feeds to use for mules are those which are grown on the farm or plantation so far as they provide the essential nutrients for a balanced ration.

The general form and appearance of the mule should resemble closely that of a horse, and in judging mules the same general points of perfection should be looked for.

Mules vary in height from 12 hands to 17½ hands and in weight from 600 pounds to 1,600 pounds.

While the mule is essentially a draft animal, it is used widely for utility purposes, especially in the South. A smart, alert mule, with a long, free stride at the walk and a snappy, balanced trot is highly desired.

Washington, D. C. Issued August, 1923; revised May, 1927

MULE PRODUCTION.[1]

By J. O. WILLIAMS, *Senior Animal Husbandman, Animal Husbandry Division, Bureau of Animal Industry.*

CONTENTS.

	Page.
Distribution of mules in the United States	1
Advantages of the mule as a work animal	2
Some peculiarities of the mule	2
Production of mules	4
Selecting the jack	4
Care of the jack	5
Feeds for the jack	6
The brood mare	6
Breeding the mare	8
Care of the pregnant mare	9
Care of mare at foaling time	10
Care of mare and foal	10
Production of mules—Continued.	
Weaning the colt	11
The orphan foal	12
Spring or fall colts	13
Educating the colt	13
Feeding and care of mules	13
Judging mules	14
Market classes of mules	17
Draft mules	19
Farm mules	19
Sugar mules	27
Cotton mules	27
Mining mules	27

DISTRIBUTION OF MULES IN THE UNITED STATES.

THE IMPORTANCE and popularity of the mule as a work animal is attested by its increased use in our farm operations. In 1910, the number of mules on farms and ranches in this country was 4,209,769. The number on January 1, 1920, increased to 5,432,391, and on January 1, 1925, the total was 5,730,608. Of the 5,730,608 mules on farms in 1925, 3,350,766, or approximately 60 per cent, were in the nine Cotton-Belt States, which in the number of mules rank as follows:

Texas	1,022,978
Oklahoma	368,547
Arkansas	338,852
Georgia	337,984
Mississippi	330,080
Alabama	300,788
North Carolina	278,611
South Carolina	199,283
Louisiana	173,643
Total	3,350,766

The only States outside the Cotton Belt having more than 170,000 head of mules on farms in 1925 were Missouri, with 390,052; Tennessee, with 351,784; Kentucky, with 301,098; and Kansas, with 259,939. The total number of horses on farms in the Cotton-Belt States on January 1, 1925, was 2,239,367, or about 66 per cent as many horses as mules. The only Cotton-Belt State having more horses than mules in 1925 was Oklahoma.

[1] In the preparation of this bulletin the writer is indebted for helpful suggestions and assistance from G. A. Bell, horse-breeding expert in the Remount Service, War Department, and R. S. Whitfield, a former employee of the Animal Husbandry Division.

ADVANTAGES OF THE MULE AS A WORK ANIMAL.

The mule is a hardy work animal. While this humble creature responds to good treatment and gives best service under favorable conditions of feeding and management, it is his ability to endure hardship and to perform sterling service under adverse conditions that has established him so firmly in American agriculture. Those who are stanch supporters of the mule say that, in comparison with the horse, he will live longer, endure more work and hardship, require less attention and feed, is less liable to digestive disorders, lameness, and disease, is more easily handled in large numbers, is less irritable, and is more capable of performing work in the hands of a mediocre or poor horseman. Whether or not all these claims may be

FIG. 1.—A pair of farm mules.

substantiated, it is a fact that the mule is well established as a work animal in those sections where climatic conditions are most severe, feed less abundant, and horsemanship is not a prevailing art (Fig. 1).

SOME PECULIARITIES OF THE MULE.

The mule is an animal with possibly more eccentricities and undeniable virtues than any other domestic animal. One would naturally expect from his heritage a rather unusual temperament requiring the most thoughtful treatment. The difficulty is to know how to handle the mule in order to keep the desirable qualities of his maternal ancestry in the foreground and to keep subservient the latent donkey characteristics. To treat consistently a conglomeration of stubbornness and willingness, temper and sullenness, contentment and restlessness, slyness and docility, faithfulness and waywardness, with no knowledge of which virtue or vice is going to assert itself next, is

a problem which may well tax the qualities of the best horseman. Yet the virtues of the mule have been so evident in times of peace and war that many ardent horse lovers who have been prejudiced against him have come to admire the animal which has no "pride of ancestry or hope of posterity" (Fig. 2).

There are some peculiarities which belong to the mule alone. He does not like to be hurried, worried, or cuffed about; to try to force him to do things against his will is practically impossible and only makes matters worse. The mule must be understood and gently but firmly persuaded to do things out of the ordinary. He is naturally suspicious of everybody who comes around him, and it can be readily observed that he never takes his eye off a person near by, and when the ears begin to wag a little the person watched had better

FIG. 2.—Many mules find their way into the U. S. Army. Good, sound mules with quality are required. This illustration shows representative types of "lead" and "wheel" mules in Army service.

be on the lookout. There seems to be a code system of ear signaling among mules that they all understand. A mean mule can deftly handle his hind legs, and his forelegs are not to be ignored. He has been known to handle his "mits" in a clever fashion. The mule seems to have an uncanny way of detecting whether a person is going to treat him harshly or kindly, and his reception is usually in like manner, nor does he forget the person who inflicts harsh treatment.

There is a wrong and a right way to lead a mule. A man who looks at a mule and lugs at his head will never make any progress. The mule will not be pulled. He will usually follow quietly, however, if a man will walk away in the direction he desires to go. Neither can you "bully" mules into going through tight places; they are somewhat like sheep, and if the leader can be induced to go the rest will follow.

Next to satisfying a hearty appetite the height of mule joy is to roll. A mule will roll at every opportunity and often at inopportune times, when he makes the opportunity suit his own convenience. He dislikes mud and water holes in the road. and is what is known as a sure-footed animal.

PRODUCTION OF MULES.

The mule is a hybrid animal having a jackass, commonly called a jack, for a sire and a mare for a dam. When the reverse cross is made and the female ass (or jennet) is bred to a stallion, the off-

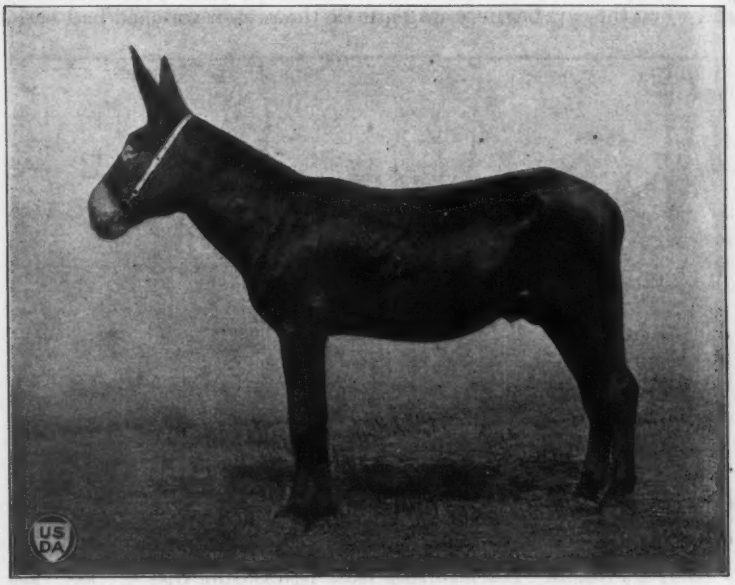


FIG. 3.—A prize-winning jack. Note size of bone and general quality throughout.

spring is called a "hinny." As the mule will not reproduce, it is necessary to maintain both jacks and mares in order to produce mules.

SELECTING THE JACK.

The importation of jacks, and consequently the production of mules, dates back to colonial times. About 1787 George Washington was presented with a jack by the King of Spain, which was used in the stud at Mount Vernon. Many good mules were produced in those days, and the value of the mule as a work animal was soon recognized by intelligent planters. It has been within the last 40 years, however, that the production of mules has been an extensive enterprise and that much attention has been given to the rearing and selection of the best jack stock.

The American jack of to-day is a composite of the bloods of some of the best foreign breeds, and in attaining the highest standard of excellence prevailing in the jack stock of America the breeders have emphasized the valuable utility points so much desired in the best jacks, such as size, weight, bone, style, quality, and action. In America jacks are usually spoken of as jennet jacks and mule jacks. As these terms imply, jennet jacks are used for mating with jennets for the reproduction of the breed, and mule jacks are used for mating with mares for the production of mules.

A good mule jack (Fig. 3) should be not less than 15 hands high and possess plenty of weight, large bone with quality, style, and action. The essential points of conformation in a good jack are a straight, strong back, closely coupled and well muscled over the loin; long and level rump; deep body and spring of rib to allow ample room for lung development. Vigor and strength of constitution are indicated by a broad chest and large heart girth.

The legs should be set straight, be well muscled, and have plenty of bone. The length of leg should be in proportion to depth of body, as height obtained by length of leg is undesirable. The size of the bone is very important and should be ample. The size of the bone is usually determined by measuring the cannon bone about half-way between the knee and the fetlock joint. This circumference should be 8½ inches in a jack of 15 hands' height. It is very desirable to have large, well-shaped feet. The head should be well proportioned, with the profile of the nose straight or slightly roman. The ears should be long, well set, and alert on a mature animal and should measure, horizontally, 33 inches or more in length from tip to tip.

Measurements of a good jack.[1]

[Weight, 1,200 pounds; height (standard measure), 15 hands, 3 inches.]

	Inches.		Inches.
Ears from tip to tip	34	Around body at girth	70
Around face and jaw	39	Around body at loin	67
Around neck at throatlatch	36	Around hoof, below coronet (next to hair)	16½
Around arm	21	Above hock	17½
Around cannon	8½	Below hock	9½
Length from poll to tail	84		

Some of the common defects in jacks which should be avoided are: Flat, narrow chest, which indicates a weak constitution and lack of vigor; light-muscled loin and long coupling; short, drooping rump; excessive length of leg; small feet with contracted heels; and short or droopy ears.

CARE OF THE JACK.

The proper care and management of the jack are somewhat exacting, as he is rather peculiar in his likes and dislikes. While a stallion may be spoiled because of his nervous temperament, the jack may be just as quickly spoiled because of his inclination to be sluggish. The jack should have a caretaker who understands jack man-

[1] Twice champion at the Missouri State Fair and reserve champion at the World's Fair, San Francisco.

agement thoroughly. This is very important, as the disposition of the jack is partly controlled by the groom. The jack should be quietly but firmly handled, as a bad disposition in a jack is usually attributable to harsh handling or mismanagement of the animal when young. Through continuous observation the groom should learn the peculiar individuality of the jack and the little things required for his proper management.

Abundant exercise is one of the big factors in the management of a breeding animal. A roomy, well-ventilated, and well-lighted box stall opening to an exercising paddock is necessary for the proper care of the jack. It is important that the exercising paddock be of good size. In order to insure plenty of exercise, however, it is well to give the jack some road work.

A young jack intended for siring mules should not be permitted to run with jennets or mules, as this practice usually leads to difficulty in teaching him to serve mares, when used in the stud. Instead the young jack should have fillies or gentle mares for companions. The jack may begin serving mares at the age of 2 or 2½ years, but he should not serve more than one mare a day during his first season nor more than 30 for the entire season. A mature jack may serve as many as two mares in a single day provided the two services are several hours apart. The number of mares a jack should serve during a season depends on the strength and vigor of the individual, but 70 or 80 mares probably is the maximum number that he can serve with satisfactory results. Artificial breeding may be employed if the jack is patronized very heavily. This not only conserves the vitality of the jack but also enables the owner to breed a much larger number of mares. If care and precaution are taken, artificial breeding may be practiced with as much success as breeding in the natural way. In fact, some mares which do not conceive from natural service are successfully impregnated artificially. It is sometimes advisable to use a stallion for teasing purposes in order to conserve the jack when the patronage is heavy.

FEEDS FOR THE JACK.

The jack is a rather sluggish animal, and for this reason his feeds should be slightly laxative in character. Bran, oats, crushed barley, and oil meal are splendid grain feeds to use. Sheaf oats and green feeds are also very satisfactory. Corn should be used only in limited amounts. Many jack breeders obtain good results by feeding sheaf oats, clover, and alfalfa hay.

THE BROOD MARE.

Sound brood mares of good quality should be selected in order to be successful in producing high-grade mules. Considerable effort is usually expended by the breeders of work horses in selecting good mares for breeding purposes, but no consistent effort is usually made by the mule breeder in exercising the same care in selecting brood mares for the production of mules. The idea seems to prevail that

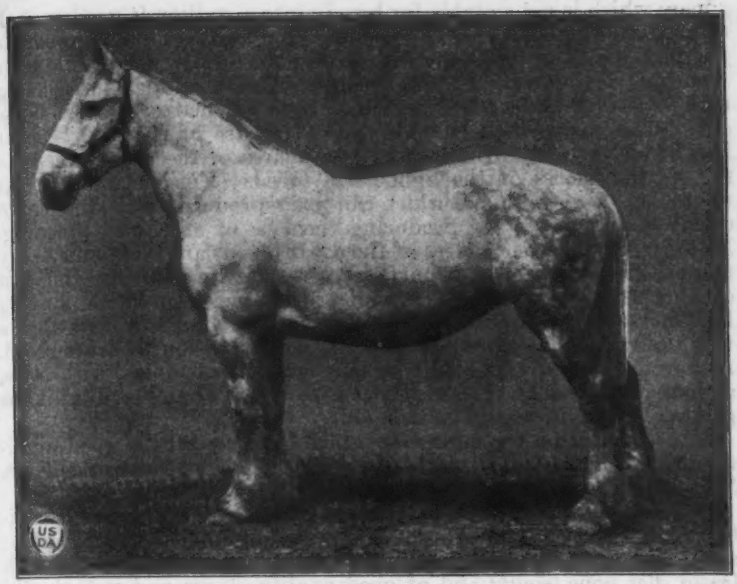


FIG. 4.—A desirable type of brood mare for producing draft mules. Note the "breediness," substance, and conformation of this mare.

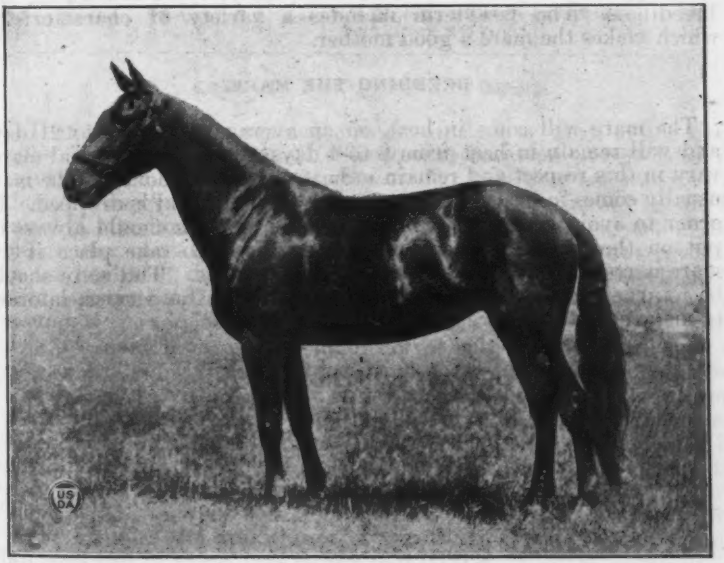


FIG. 5.—A desirable type of light "mule mare" for producing mules of quality. Note roominess of body, short back, depth of heart girth, and "breediness" of this mare.

45320°—27——2

a mare which is not suitable for breeding to a stallion is good enough to produce a mule. This is a mistake, for no matter how good the jack may be, it is inconsistent to expect uniformly good mule colts from inferior mares. The same care should be applied in selecting mule mares as is exercised in selecting brood mares to raise horse colts. The mares used in mule production are of no fixed type or breed and vary from the large, heavy mares of the draft breeds to the smaller mares of the light-horse breeds (Figs. 4 and 5). As the mule is a work animal which can not reproduce its kind, it is not essential that mares for producing them be of any fixed breeding. Mules from the larger mares of the draft breeds are large and heavy and are excellent for draft purposes, but they are more sluggish and can not stand heat so well as mules produced from mares having light-horse blood in their veins. Experienced breeders state that a very desirable mule mare is one having about one-fourth draft blood. A mare of this breeding will produce good-sized mules, with style, action, and stamina. It seems that type rather than breeding is the prime requisite of a good mule mare.

In conformation the mule mare should possess all the good qualities desired in the brood mare used for producing good work horses. Some of the most important points of the good mule mare are:

A broad chest and large heart girth, indicating a vigorous constitution; a roomy barrel to allow for full development of the fetus; a straight back, strongly muscled over the loins; well-set legs with broad, flat bone, sound and of good quality; large and well-shaped feet; and feminine character, indicating "breediness." To sum up, the mare should combine size with quality, type, soundness, and breediness. The last term includes a variety of characteristics which makes the mare a good mother.

BREEDING THE MARE.

The mare will come in heat, on an average, every 18 to 21 days and will remain in heat from 2 to 4 days, though exceptional mares vary in this respect and remain in heat only a few hours. The mare usually comes in heat on the ninth day after the foal is dropped. In order to avoid accidents at breeding time, hobbles should always be put on the mare. Conception is more likely to take place if the mare is rested for a few hours at time of service. The mare should be returned to the jack in from 18 to 21 days after service, in order to make sure that conception has taken place.

TABLE 1.—*Calendar showing time of service and date of foaling based on 340-day gestation period for mares.*

Day of month mare is bred.	Date of foaling.											
	Bred in Jan.	Bred in Feb.	Bred in Mar.	Bred in Apr.	Bred in May.	Bred in June.	Bred in July.	Bred in Aug.	Bred in Sept.	Bred in Oct.	Bred in Nov.	Bred in Dec.
	Dec.	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May.*	*June.*	*July.*	*Aug.*	*Sept.*	*Oct.*	*Nov.*
1	6	6	3	6	5	6	5	6	6	5	6	5
2	7	7	4	7	6	7	6	7	7	6	7	6
3	8	8	5	8	7	8	7	8	8	7	8	7
4	9	9	6	9	8	9	8	9	9	8	9	8
5	10	10	7	10	9	10	9	10	10	9	10	9
6	11	11	8	11	10	11	10	11	11	10	11	10
7	12	12	9	12	11	12	11	12	12	11	12	11
8	13	13	10	13	12	13	12	13	13	12	13	12
9	14	14	11	14	13	14	13	14	14	13	14	13
10	15	15	12	15	14	15	14	15	15	14	15	14
11	16	16	13	16	15	16	15	16	16	15	16	15
12	17	17	14	17	16	17	16	17	17	16	17	16
13	18	18	15	18	17	18	17	18	18	17	18	17
14	19	19	16	19	18	19	18	19	19	18	19	18
15	20	20	17	20	19	20	19	20	20	19	20	19
16	21	21	18	21	20	21	20	21	21	20	21	20
17	22	22	19	22	21	22	21	22	22	21	22	21
18	23	23	20	23	22	23	22	23	23	22	23	22
19	24	24	21	24	23	24	23	24	24	23	24	23
20	25	25	22	25	24	25	24	25	25	24	25	24
21	26	26	23	26	25	26	25	26	26	25	26	25
22	27	27	24	27	26	27	26	27	27	26	27	26
23	28	28	25	28	27	28	27	28	28	27	28	27
24	29	29	26	29	28	29	28	29	29	28	29	28
25	30	30	27	30	29	30	29	30	30	29	30	29
26	31	31	28	31	30	31	30	31	31	30	31	30
	Jan.	*Feb.*	*Mar.*	*Apr.*	*May.*	*June.*	*July.*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
27	1	1	1	1	1	1	1	1	1	1	1	1
28	2	2	2	2	2	2	2	2	2	2	2	2
29	3	.....	3	3	3	3	3	3	3	3	3	3
30	4	.....	4	4	4	4	4	4	4	4	4	4
31	5	.....	5	.....	5	.....	5	5	.....	5	.....	5

CARE OF THE PREGNANT MARE.

There should be no sudden changes in feed or work of the mare after she becomes pregnant. She should be given a well-balanced ration of feed that will supply the needs of her own body as well as those of the growing fetus. Feeds that are too fattening should be avoided, also moldy or damaged hay, as there is a suspicion that either may cause abortion. Exercise is a most important essential to the health of the pregnant mare, as well as for the development of a strong, healthy foal. The best and most economical way of giving this exercise is by using the mare in regular farm work. The pregnant brood mare should not be subjected to hard pulls or severe strains. By using care and judgment the mare may be safely worked up to within a week or ten days of foaling. The average gestation period of mares—that is, the length of time that they carry their foals—is about 340 days. This period varies slightly with individual mares. It is important that a careful record be kept of the date of service to the jack in order that the time of foaling may be anticipated. A very sure sign that the foal will be dropped in a short while is the appearance of wax on the teats, which usually appears two or three days before parturition.

CARE OF MARE AT FOALING TIME.

About a week or ten days before the foal is expected the mare should be turned into a pasture or paddock, where there is no danger of injury from other animals. If the weather is mild, a paddock or pasture is a desirable place for the foal to be delivered. There is probably less danger of infection in a pasture than in a stable. If desirable conditions for foaling outside can not be provided for, a roomy box stall that has been well cleaned out, disinfected, and bedded with fresh straw should be provided.

It is well to observe the mare closely when the foal is expected, in order that assistance may be given in delivery if necessary. It will be necessary for the attendant to be where he can see the mare and yet be unseen by her. Should she need assistance, a veterinarian should be summoned at once. If it is essential that aid be given, the service should be rendered by one who has had experience with and understands the many phases of difficult parturition.

If the foal has been delivered satisfactorily, the attendant should remove as soon as possible any tissue or matter that may be clogging its nostrils and see that respiration is started. Assistance may be rendered in this respect by blowing into the foal's nostrils and rubbing its sides with a cloth or wisp of straw. As soon as practicable, without disturbing the mare unnecessarily, remove the afterbirth from the proximity of the mare and, if foaling occurred in a stable, clean out the bedding that has been soiled during parturition, sprinkle lime on the floor where the bedding has been removed. and supply fresh bedding.

To prevent infection, the navel cord of the foal should be saturated with full-strength tincture of iodin or a solution of 1 to 1,000 corrosive sublimate, and then dusted with powdered slaked lime. This should be repeated each day until the navel cord drops off. A normal foal will usually find its own way to the mare's udder soon after arrival. If, however, the foal is weak and unable to stand within two or three hours after birth, it should be assisted in getting its first meal. It is very important that the newborn foal get the first milk from its dam, which is a substance called colostrum. In addition to having the food properties so much needed by the new born, the colostrum also has a purgative effect, which stimulates the action of the digestive tract in eliminating the fecal matter already collected during the period of gestation. If this fecal matter is not eliminated within 24 hours after the colt is born, a dose of castor oil (2 to 4 tablespoons) shaken well in milk should be given and repeated in three or four hours until the desired results are obtained.

CARE OF MARE AND FOAL.

The mare should receive bran mashes and light feeds until she has recovered from the effects of foaling and the feverish condition of her system has disappeared. The ration should then be increased gradually until the mare is on full feed.

When the weather is warm and pleasant, the mare and foal may be turned out on pasture or paddock as soon as the foal is able to follow, as exercise is very beneficial and they will thrive better in the open.

If the mare was being worked prior to foaling, she will be ready for work again in 10 days or two weeks after the colt is born. When this is done the colt should be confined in a stable or paddock and not permitted to follow in the fields. The mare and colt will fret for each other for a while, but they will soon become accustomed to separation. When working, the mare should be returned to the stable once in the forenoon and in the midafternoon to allow the colt to suckle. The mare should be allowed to cool before being turned in with the colt, as there is danger of causing the colt to have scours and other digestive troubles if the mare is overheated when nursing.

When the mare is idle during the fly season, it is best to keep her and her foal in a darkened stable in the day and turn them out on pasture at night. The mare should be fed some grain and hay, as grass alone will not supply the needs of her body and also provide a sufficient milk flow for the colt.

The colt usually begins to eat a small amount of grain at the age of three or four weeks. Oatmeal should be the first grain fed and bran may be added later. Best results in feeding grain to colts in the open are obtained by building a creep under which they may pass at all times and which will prevent the mares or other mature horses from reaching the feed provided for the colts. The colt will eat only a little grain at first, but it is worth much to have it begin eating a small amount as soon as possible, because the more accustomed it becomes to eating grain while young the less trouble there will be at weaning time. The mare may be induced to frequent the creep by giving her an occasional feed near there also.

WEANING THE COLT.

Under ordinary conditions the colt is usually weaned when about six months old, but if the mare is working and the colt is thrifty it may be weaned earlier. When the colt has been taught to eat grain early, this separation from its dam need not cause any check in the colt's development. This is a trying time in the life of a colt, however, and it should receive additional feed and care to make up for the loss of the mother's milk from its ration. When the colt is once taken away from the mare, the separation should be made complete.

The mare requires some individual attention at weaning time. It will be necessary to milk her by hand for a few days to prevent too much milk from collecting in the udder and causing it to become caked and swollen. To assist in the drying-up process, the mare should be milked only partially dry and if the milk flow is maintained the grain ration should be reduced for a few days.

CARE OF THE COLT AFTER WEANING.

At no time in the colt's life is pasture more important than at the time of weaning. On being taken away from its dam, the colt needs succulent feed and the best way of supplying this feed is by having a good pasture. Not only is a good pasture necessary for the development of the colt, but it is also necessary if the colt is to be raised in an economical manner. In addition to the pasture the colt should

receive liberal amounts of grain and hay. Half of its growth is made during its first year and it should have every advantage possible for its development. Colts like companionship and they do better if several are allowed to run together (Fig. 6).

THE ORPHAN COLT.

It may happen sometimes that the mare dies soon after foaling or fails to give milk enough for her foal. When either of these misfortunes occurs the colt must be raised by hand, which is a tedious undertaking but is worth while if done properly. As a feed for the orphan colt, the best and most practical substitute for mare's milk is cow's milk after it has been prepared to conform as nearly as possible

FIG. 6.—Mule foals like companionship. A group of weanlings on pasture.

in composition to the milk of the mare. This is done by selecting milk that is low in butterfat and diluting it with one part of fresh water for three parts of milk. Add a tablespoon of sugar and three or four tablespoons of limewater to a pint of this diluted milk and heat to body temperature. Give the foal about a half teacup of this prepared milk at first and at short intervals gradually increase the amount and the length of time between feeding periods as the foal develops. A bottle with a rubber nipple attached is the most convenient way to give milk to the orphan. As the foal suckles frequently in small amounts when following its dam, one should feed it frequently and thus conform as nearly to natural conditions as possible.

The utensils used in feeding the orphan foal should be kept scrupulously clean. This can be done by freely utilizing hot water and sunshine, both of which are enemies to germs that collect and thrive in milk containers.

SPRING OR FALL COLTS.

The climatic conditions and nature of the farm work determine largely whether it is best to have the colts come in the spring or in the fall.

The natural breeding season for mares is in the spring, which is the generally accepted time to have colts. There are, however, several advantages of having fall colts, especially in the South. The fall-born colt comes at a time when the mare can probably be more easily spared from farm work and at a time when flies are not so abundant. Another advantage is that the fall colt is weaned at a time when it can be turned on to pasture and its development is not retarded at this critical time. The spring colt is weaned at a time when the grazing season is practically over.

EDUCATING THE COLT.

The time to begin the education of the colt is early in its life. It should be halterbroken and taught to be led when a few weeks old. The more the colt is handled when young the fewer difficulties will be encountered later when it is desired to put him to work.

Mules reach maturity at the age of 5 years, but they may be given light work when 3 years old. Care should be taken not to overload young mules. Overtaxing the young animal not only tends to check its development but also causes it to become unreliable as a worker, and possibly balky. A young mule that becomes accustomed to moving a load every time it is called upon will develop into a reliable work animal.

FEEDING AND CARE OF MULES.

Too little thought and attention are usually given to the proper methods of management and feeding of mules. Where the use of mules as work stock prevails, the feeding is usually done in a haphazard manner without regard to efficiency and economy. The essentials of a good caretaker are judgment and common sense combined with some knowledge of feeds. The most practical feeds to use are those which are grown on the farm or plantation so far as they provide the essential nutrients for a balanced ration. Corn, oats, and barley are the most widely used grains, as there is hardly a section of the United States where one or more of these grains are not grown. These grains may be combined to make a satisfactory feed or taken singly and supplemented with such feeds as bran, oil meal, or cottonseed meal to make a balanced ration. A balanced ration is one which will supply the protein and carbohydrate elements in such proportion as to meet as nearly as possible the body requirements of the animal for doing the work which it is to perform.[2] The same principles that are used in the correct feeding of horses may also be applied to the feeding of mules. As a general rule 1.1 pounds of grain and 1¼ pounds of hay daily per 100 pounds of live weight will be found to be about the right amount of feed to use for an animal at medium work. The exact

[2] Methods of computing a balanced ration are fully explained in Farmers' Bulletin 1030, Feeding Horses, which may be obtained on request from the Division of Publications, Department of Agriculture, Washington, D. C.

quantity of feed depends upon the individual animal and must be determined by the feeder.

While there are many cases in which mules are underfed, there are probably many others in which the owner suffers financially because the mules are fed more high-priced feeds than they really need, through the use of improperly balanced rations. Overfeeding is most likely to be done during the winter months, when the mules are idle. During this period idle mules may be kept in good condition largely on hay and straw and a small amount of grain. Mules that are worked hard and are receiving heavy rations should have their feed allowance diminished when idle. Idle mules thrive better if they are not confined in stables but are kept in the open.

Digestive disorders are more prevalent among work stock during the spring and summer months than at any other time. This is due to the improper feeding and watering of overheated animals. If the work animal appears to be excessively warm when brought in from work, it should be permitted to cool off before watering or feeding. Attention to such details will prevent many cases of colic. Mules sometimes suffer in hot weather from heat because they are allowed to eat too much grain or hay. This is most likely to occur when fresh, new hay is being fed. The hay ration should be fed mainly at night so that there will be several hours in which the mule may partly digest and assimilate this bulky feed before going to work.

Mules like to roll after being unharnessed, and they should have a place where they may rest themselves in this way. They will be much more comfortable in summer if they are turned out of their stables at night after they have cleaned up their feed. If they are turned on to pasture at night they will sweat more the next day, but the beneficial effects obtained from the grass and being in the open will more than offset the effects of excessive sweating. If unable to provide pasture for the mules at night during the summer, a paddock or lot should be provided where they may be comfortable.

JUDGING MULES.

The general form and appearance of the mule should resemble closely that of a horse, and in judging mules the same general points of perfection are looked for. The nearer the mule approaches the ideal desired in a draft horse the more valuable he is from a market standpoint. In the mule there are certain characteristics derived from his paternal side which are mainly indicated in his bray, disposition, ears, tail, and feet, aside from which the mule does not differ materially from the dam.

Mules vary in height from the little 12-hand pit mules to the large draft mules standing 17½ hands. The range in height of various classes of mules is given in another portion of this bulletin under "Market classes of mules."

The weight of mules varies from 600 pounds to 1,600 pounds. The average weight of the larger type of mules varies between 1,150 and 1,400 pounds and is the range of weight within which the majority of the most marketable mules are classified.

The form of the mule should be compact, with a deep body, broad chest, full flanks, short back, and well-sprung ribs. Light, waspy flanks, long narrow bodies, and long backs are not desirable.

Quality is rather difficult to define, but is that which every capable judge looks for in any animal. It is indicated in a mule by a trim, fine ear, clean-cut head and joints, flinty flat bone, well-defined tendons, and soft, silky hair. Quality marks the difference between a "market topper" and a "jar head." A short, thick ear, a coarse head, round, spongy bone, and a harsh coat of hair are indications which the judge should discriminate against.

The natural tendency of the mule is to be lazy and obstinate. An active, energetic mule is much desired.

It is in the hind quarters of the mule that the greatest faults of conformation are usually found. The croup is often very short

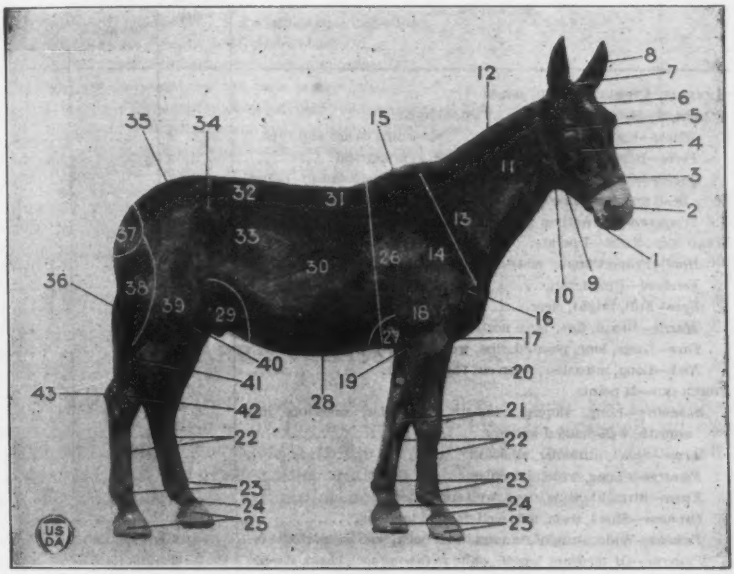


FIG. 7.—The points of the mule: 1, mouth; 2, nostril; 3, nose; 4, face; 5, eye; 6, forehead; 7, poll; 8, ear; 9, lower jaw; 10, throatlatch; 11, neck; 12, crest; 13, shoulder bed; 14, shoulder; 15, withers; 16, point of shoulder; 17, breast; 18, arm; 19, elbow; 20, forearm; 21, knees; 22, cannons; 23, fetlocks; 24, pasterns; 25, feet; 26, heart girth; 27, fore flank; 28, underline; 29, hind flank; 30, barrel; 31, back; 32, loin; 33, coupling; 34, hip; 35, croup; 36, tail; 37, buttock; 38, quarters; 39, thigh; 40, stifle; 41, gaskin; 42, hock; 43, point of hock.

and steep, the hips sloping, the thighs narrow, and the hind legs sickle shaped. These are faults of conformation that judges should discriminate against sharply. It is in the hind quarters and loins that the draft animal obtains propelling power. These portions of the animal, therefore, should be correctly built and properly developed. The loins should be broad, short, and thickly muscled; the croup long and level; the hips long, level, and muscular; the thighs thick,

long, and well muscled; and the hind legs well set, with broad, clean-cut hocks and flat, dense bone. The mule should stand on good feet that are well shaped.

While the mule is essentially a draft animal, it is used widely for general utility purposes, especially in the South. Though style and action may not be so important qualities in a mule as they are in the lighter breeds of horses, these qualities add materially to its value. A smart, alert mule, with a long, free stride at the walk and a snappy, balanced trot is highly desired. Figure 7 and the accompanying score card give points in the study of conformation.

Score Card for the Mule.

Scale of points.	Standard score.	Points given animal judged.	
		Student's score.	Corrected score.
GENERAL APPEARANCE—16 points:			
Height—Estimated hands....; actual hands.....			
Weight—Estimated....; actual....; according to age and type....	4		
Form—Broad, deep, compact, smooth, symmetrical	4		
Quality—Clean, dense bone with sufficient substance; refined head and ears; fine hair; defined joints and tendons	4		
Temperament—Active; good disposition	4		
HEAD AND NECK—7 points:			
Head—Proportionate; clear-cut features	1		
Forehead—Broad, full	1		
Eyes—Full, bright, clear	1		
Muzzle—Broad, fine; large nostrils; trim and even lips	1		
Ears—Large, long, pointed, fine, well set, carried alert	1		
Neck—Long, muscular, clean-cut throatlatch	2		
FOREHAND—24 points:			
Shoulders—Long, sloping, smooth, muscular, blending into smooth, well-defined withers	3		
Arms—Short, muscular, elbow in	1		
Forearms—Long, wide, muscular	2		
Knees—Straight, wide, deep, well supported	2		
Cannons—Short, wide, flat, well-defined tendons	2		
Fetlocks—Wide, straight, tendons well back, well supported	1		
Pasterns—Of medium length, oblique (about 45°), clean, strong	3		
Feet—Of medium size, set straight; dense, smooth horn; slope of wall parallel to pastern; wide, high heels; concave sole; strong bars; prominent, elastic frog	6		
Leg position—In front, a perpendicular line from point of shoulder should divide the leg and foot into lateral halves; from the side, a similar line from the bony prominence on shoulder blade should pass through the center of elbow, knee, and pastern joints, and meet the ground back of foot	4		
BODY—9 points:			
Chest—Deep, wide	2		
Ribs—Long, well sprung, close	2		
Back—Short, broad, strong	2		
Loin—Short, wide, muscular	2		
Flanks—Deep, full; long, low underline	1		

Score Card for the Mule—Continued.

Scale of points.	Standard score.	Points given animal judged.	
		Student's score.	Corrected score.
HIND QUARTERS—32 points:			
Hips—Wide, level, smooth, muscular	2		
Croup—Long, level, muscular	2		
Tail—Set high, well carried	1		
Quarters and thighs—Deep and muscular; strongly joined to gaskins	3		
Stifles—Broad, thick, strong	1		
Gaskins—(Lower thighs) long, wide, muscular	2		
Hocks—Straight, wide, prominent points, deep, flat, clean-cut, well supported	6		
Cannons—Similar to front, but a trifle longer and wider	2		
Fetlocks—Wide, straight, tendons well back	2		
Pasterns—Similar to front, but less sloping (about 55°)	3		
Feet—Similar to front, but not quite as large	4		
Leg position—From rear, a perpendicular line from point of buttock should divide the leg and foot into lateral halves; from the side, this same line should touch the point of hock and run parallel to the cannon. A similar line from hip joint should meet the ground midway between heel and toe	4		
ACTION—12 points:			
Walk—Active, straight, balanced, long stride	7		
Trot—Straight, long, free, regular, snappy stride	5		
Total	100		

MARKET CLASSES OF MULES.

Mules are classified according to their use. There are many local market classifications of mules, but they may be grouped into five general classes. Each class includes mules of a general type, while there are various grades and weights within a specific class.

The general classes of mules are shown in the table.

TABLE 2.—*Ranges in height and weight of various classes of mules.*[8]

Class.	Range in height.	Range in weight.
	Hands.	*Pounds.*
Draft	16 to 17½	1,200 to 1,600
Farm	15½ to 16	900 to 1,250
Sugar	16 to 17	1,150 to 1,300
Cotton	13½ to 15½	750 to 1,100
Mining	12 to 16	600 to 1,350

Each of the classes is graded according to conformation, soundness, quality, condition, and action into the following grades: Choice, good, medium, common, inferior.

[8] Market Classes and Grades of Horses and Mules. Bulletin 122, Illinois Agricultural Experiment Station, 2d ed. 1912.

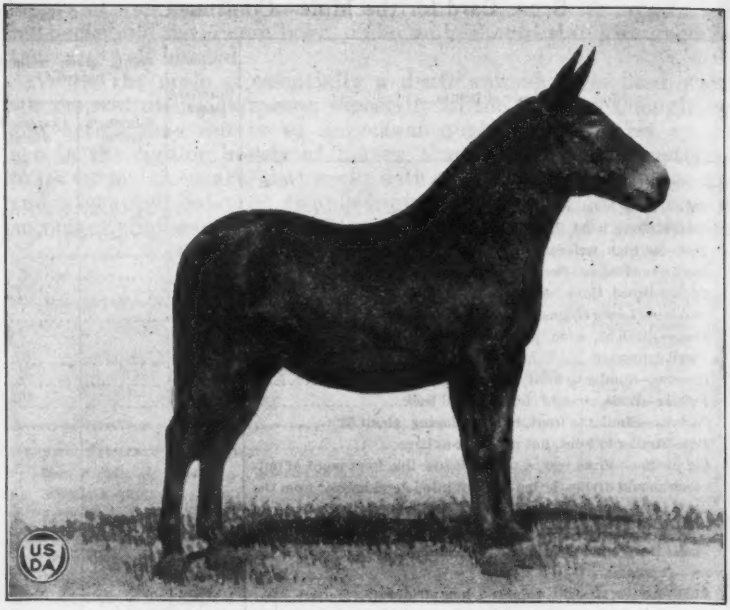


FIG. 8.—A choice draft mule. Champion mule at American Royal Livestock Show, Kansas City, Mo., 1922.

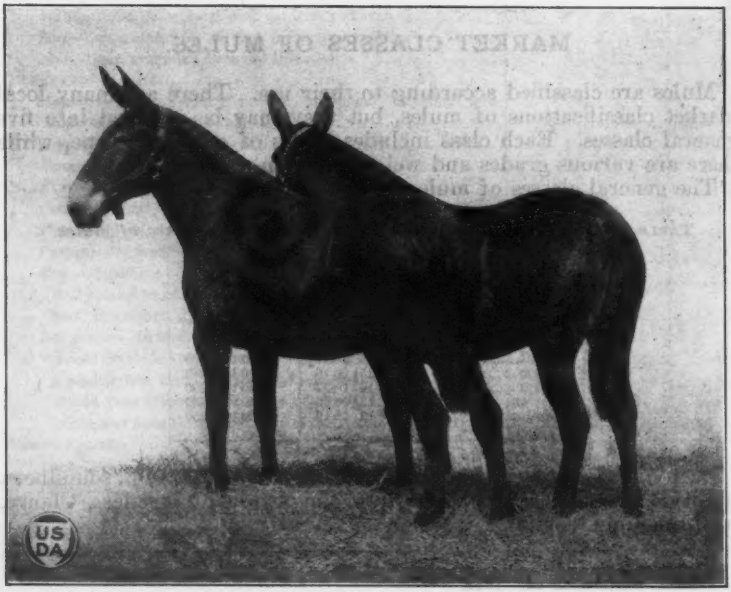


FIG. 9.—A pair of choice draft mules.

DRAFT MULES.

The draft-mule class includes the largest mules (Figs. 8, 9, 10), standing from 16 to 17½ hands and weighing from 1,200 to 1,600 pounds. Some exceptional draft mules exceed the maximum weight given for this class. They are used largely for heavy teaming in large cities, especially in the warmer climates; for contract jobs, such as road grading and railroad work; and for lumber work. Mules for contract work are usually designated by an appropriate descriptive name, such, for instance, as "railroaders." The heaviest draft mules find their way to the lumber camps. Contract mules

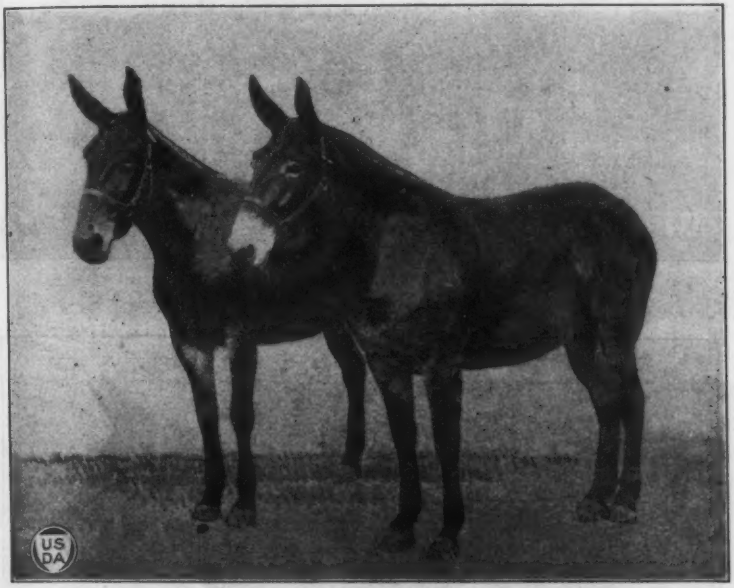


FIG. 10.—A pair of good draft mules.

must have more quality than lumber mules, but extreme weight is not so essential. The greatest demand for draft mules is for those between the ages of 5 and 8 years.

There is no special preference in regard to sex. The highest prices paid are for those mules having weight combined with heavy bone, large, well-shaped feet, strong, short backs, closely coupled with abundant muscling over the loin and hind quarters.

FARM MULES.

Mules purchased in the market for farm work in the Middle Western States are known as "farm mules." There is more variation in quality and type in this class than in any other class, as the demand for a specific type is not so well defined (Figs. 11, 12, 13, 14).

FIG. 11.—A pair of large farm mules.

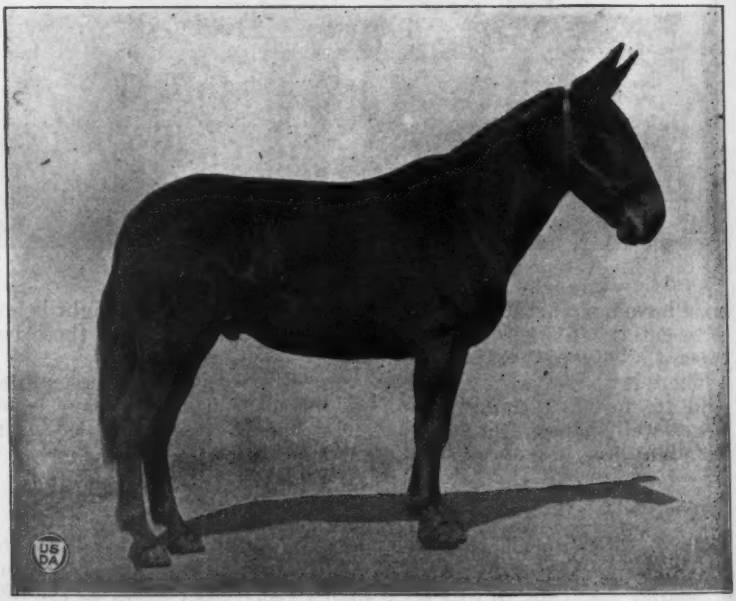


FIG. 12.—A good farm mule.

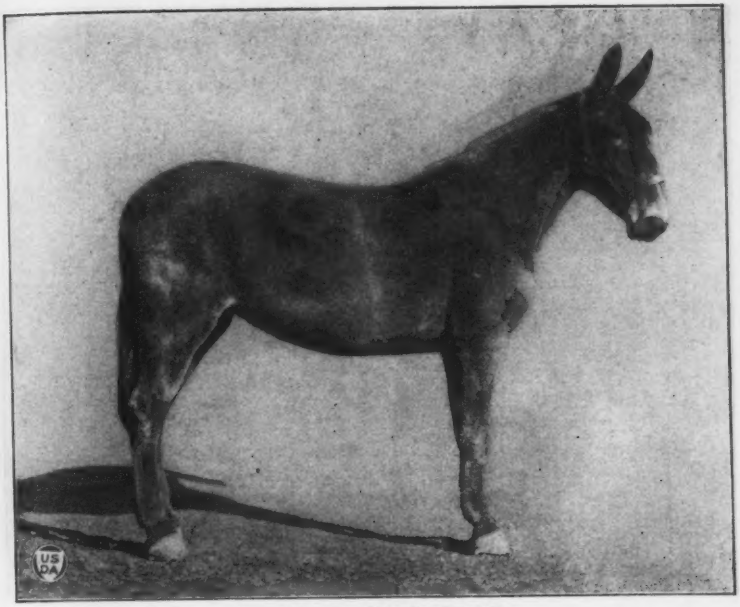


FIG. 13.—A medium farm mule.

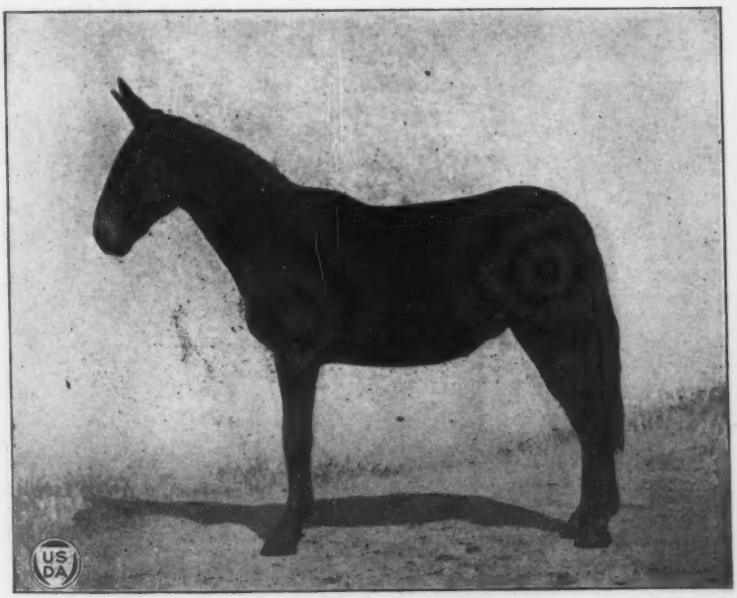


FIG. 14.—Common farm mule.

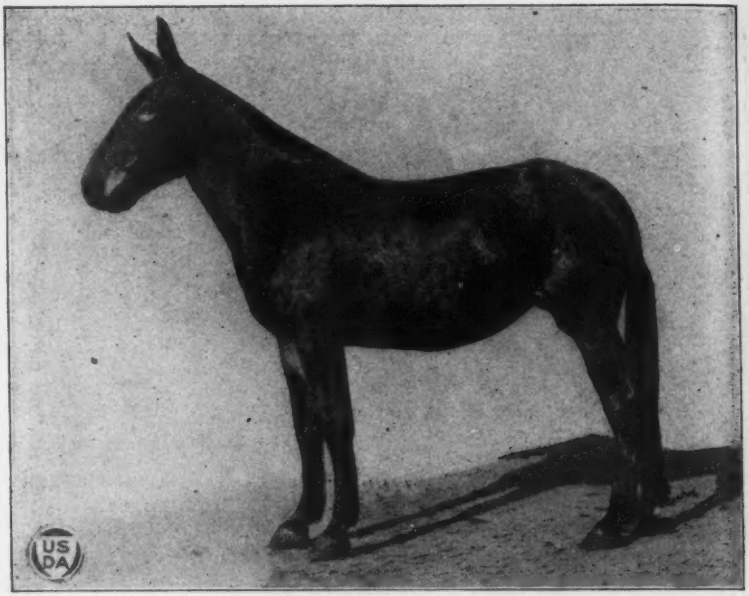


FIG. 15.—A choice sugar mule.

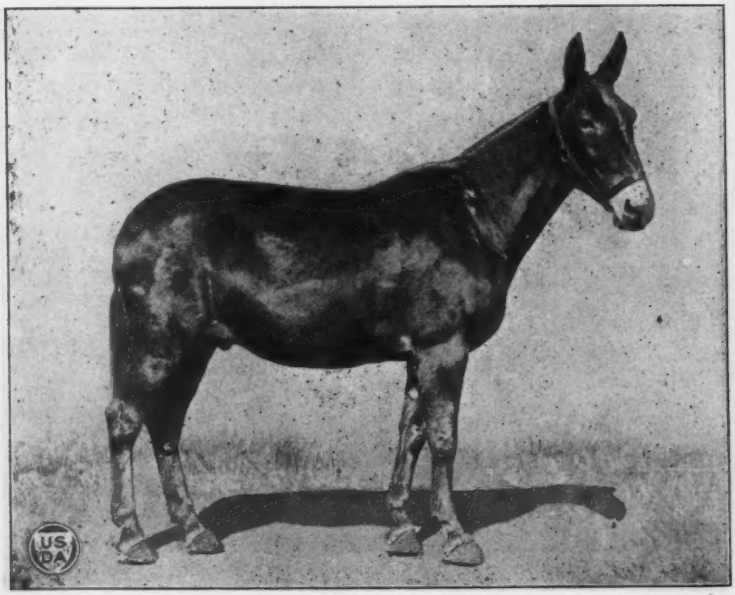


FIG. 16.—A good sugar mule.

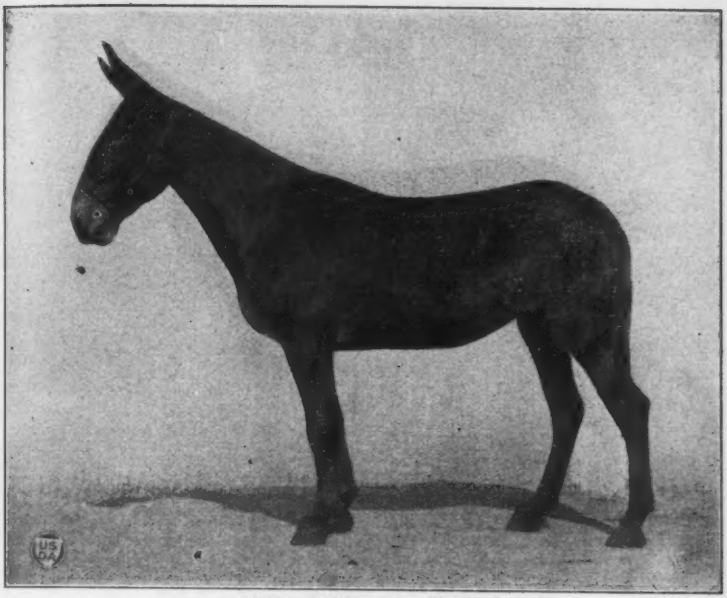


FIG. 17.—Common sugar mule.

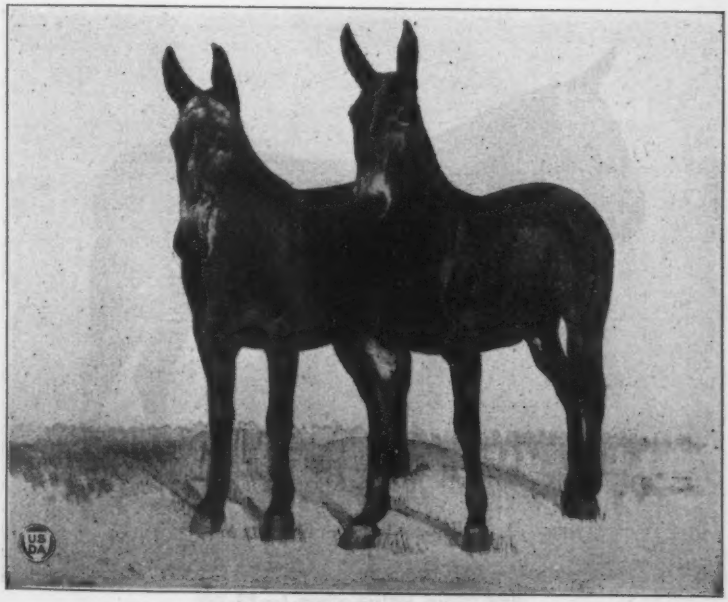


FIG. 18.—A team of choice cotton mules.

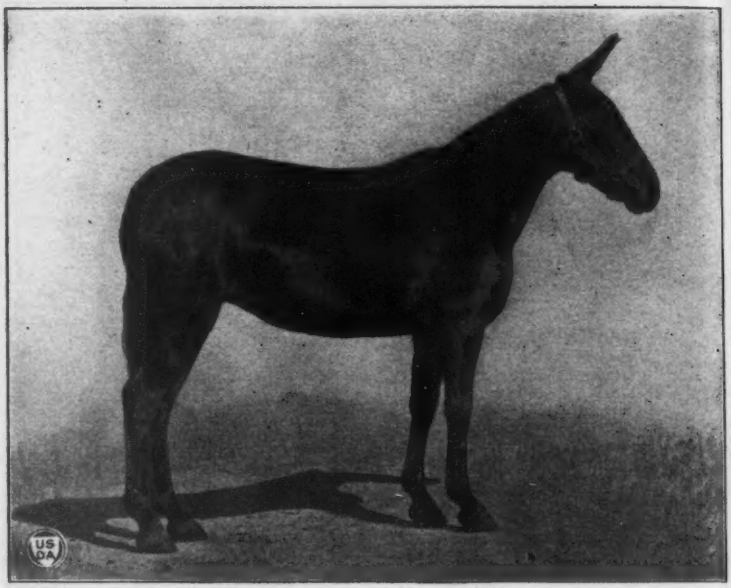


FIG. 19.—A good cotton mule.

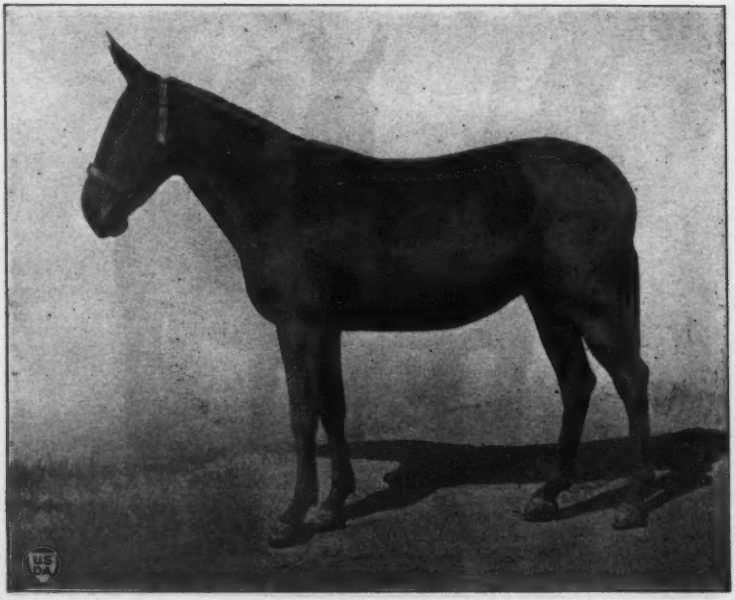


FIG. 20.—A medium cotton mule.

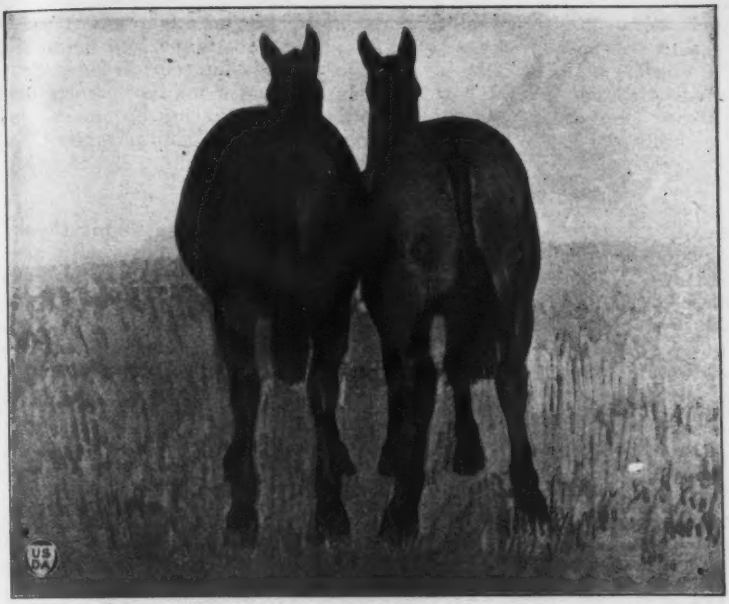


FIG. 21.—A team of choice surface mining mules.

FIG. 22.—A choice surface mining mule.

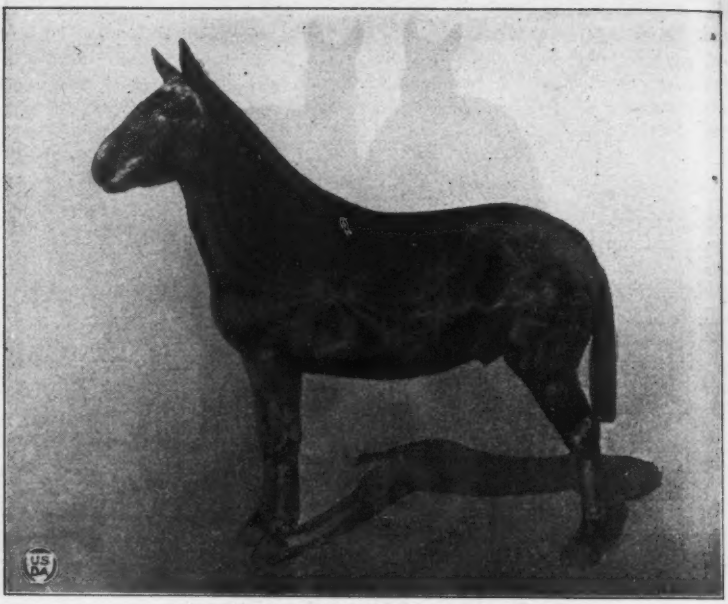


FIG. 23.—A choice pit mining mule.

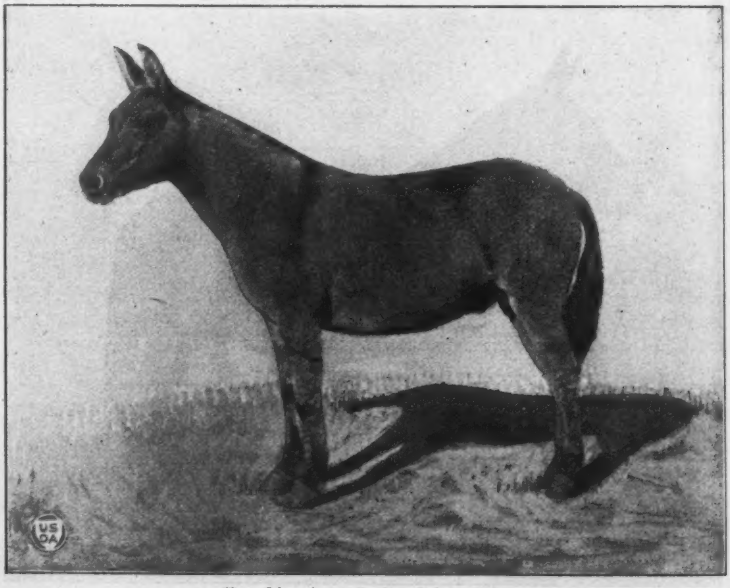


FIG. 24.—A good pit mining mule.

Mules in this class may be plain draft mules or cotton mules that lack finish and condition, as the farmer likes to buy mules with a prospect of developing them into more valuable animals. Many of them are worked for a season and then fitted for the market, where they are placed into one of the other specific classes, such as "drafters," "sugar mules," "cotton mules," "miners," or "railroaders."

SUGAR MULES.

Sugar mules are those which are purchased for shipment to the sugar plantations of the South. This class of mules is somewhat rangy in type and should have quality, style, and finish. The mules in this class are heavier and more compact than cotton mules, but not so heavy as draft mules. The range in weight is from 1,150 to 1,300 pounds. In selecting sugar mules special attention should be given to quality and adaptability to the work. The feet should be large and well shaped. Mare mules are preferred for the sugar trade (Figs. 15, 16, 17).

COTTON MULES.

As the name implies, cotton mules are purchased for cotton plantations. The type (Figs. 18, 19, 20) is somewhat lighter and more angular than the sugar or surface-mining mule and heavier than the pit mule. While there is a gradation of quality and age in this market class, the planters of the South are becoming more and more inclined to increased weight and quality in their mules than prevailed a few years ago. A choice cotton mule weighs about 1,150 pounds and is alert and active, but most mules in this class vary from 750 to 1,100 pounds. The custom in the Cotton Belt is to buy mules in the spring for the crop season and dispose of them in the fall. As they are usually in poor condition following the heavy summer's work, they are sold in the fall for a fraction of the purchase price. These mules are wintered, fattened, and sold back to the planter in the spring. For this reason the age limits within this class are variable. Mules from 5 to 7 years old are preferred, however, for this trade and bring the best prices.

MINING MULES.

There is a wide range in weight among mining mules, varying from 600-pound pit mules to 1,350-pound surface mules (Figs. 21, 22, 23, 24). Good feet and freedom from blemishes are requirements for mules to qualify for top prices for the mining trade.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

April 25, 1927

Secretary of Agriculture	W. M. JARDINE.
Assistant Secretary	R. W. DUNLAP.
Director of Scientific Work	A. F. WOODS.
Director of Regulatory Work	WALTER G. CAMPBELL.
Director of Extension Work	C. W. WARBURTON.
Director of Information	NELSON ANTRIM CRAWFORD.
Director of Personnel and Business Administration	W. W. STOCKBERGER.
Solicitor	R. W. WILLIAMS.
Weather Bureau	CHARLES F. MARVIN, *Chief.*
Bureau of Agricultural Economics	LLOYD S. TENNY, *Chief.*
Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Bureau of Plant Industry	WILLIAM A. TAYLOR, *Chief.*
Forest Service	W. B. GREELEY, *Chief.*
Bureau of Chemistry	C. A. BROWNE, *Chief.*
Bureau of Soils	MILTON WHITNEY, *Chief.*
Bureau of Entomology	L. O. HOWARD, *Chief.*
Bureau of Biological Survey	E. W. NELSON, *Chief.*
Bureau of Public Roads	THOMAS H. MACDONALD, *Chief.*
Bureau of Home Economics	LOUISE STANLEY, *Chief.*
Bureau of Dairy Industry	C. W. LARSON, *Chief.*
Office of Experiment Stations	E. W. ALLEN, *Chief.*
Office of Cooperative Extension Work	C. B. SMITH, *Chief.*
Library	CLARIBEL R. BARNETT, *Librarian.*
Federal Horticultural Board	C. L. MARLATT, *Chairman.*
Insecticide and Fungicide Board	J. K. HAYWOOD, *Chairman.*
Packers and Stockyards Administration	JOHN T. CAINE III, *in Charge.*
Grain Futures Administration	J. W. T. DUVEL, *in Charge.*

This bulletin is a contribution from

Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Animal Husbandry Division	E. W. SHEETS, *Chief.*

28

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
5 CENTS PER COPY

▽

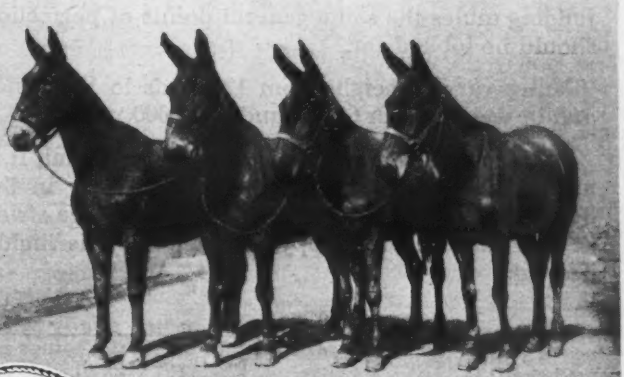
LIBRARY
OCT 24 19
Mar. 1929

U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1341

Rev.ed. follows

MULE PRODUCTION



THE ABILITY of the mule to endure hardship and perform sterling service under adverse conditions has established him as a real asset in American agriculture.

The mule will give best service under favorable conditions of feeding and management.

Good, sound mares should be selected for breeding in order to be successful in producing high-grade mules. A very desirable "mule mare" is one having about one-fourth draft blood.

The most practical feeds to use for mules are those which are grown on the farm or plantation so far as they provide the essential nutrients for a balanced ration.

The general form and appearance of the mule should resemble closely that of a horse, and in judging mules the same general points of perfection should be looked for.

Mules vary in height from 12 hands to 17½ hands and in weight from 600 pounds to 1,600 pounds.

While the mule is essentially a draft animal, it is used widely for utility purposes, especially in the South. A smart, alert mule, with a long, free stride at the walk and a snappy, balanced trot is highly desired.

Washington, D. C.

Issued August, 1923
Revised May, 1927, and March, 1929

i.e., 1926

#1341

MULE PRODUCTION.[1]

By J. O. WILLIAMS, *Senior Animal Husbandman, Animal Husbandry Division, Bureau of Animal Industry.*

CONTENTS.

	Page.
Distribution of mules in the United States	1
Advantages of the mule as a work animal	2
Some peculiarities of the mule	2
Production of mules	4
Selecting the jack	4
Care of the jack	5
Feeds for the jack	6
The brood mare	6
Breeding the mare	8
Care of the pregnant mare	9
Care of mare at foaling time	10
Care of mare and foal	10
Production of mules—Continued.	
Weaning the colt	11
The orphan foal	12
Spring or fall colts	13
Educating the colt	13
Feeding and care of mules	13
Judging mules	14
Market classes of mules	17
Draft mules	19
Farm mules	19
Sugar mules	27
Cotton mules	27
Mining mules	27

DISTRIBUTION OF MULES IN THE UNITED STATES.

THE IMPORTANCE and popularity of the mule as a work animal is attested by its increased use in our farm operations. In 1910, the number of mules on farms and ranches in this country was 4,209,769. The number on January 1, 1920, increased to 5,432,391, and on January 1, 1925, the total was 5,730,608. Of the 5,730,608 mules on farms in 1925, 3,350,766, or approximately 60 per cent, were in the nine Cotton-Belt States, which in the number of mules rank as follows:

Texas	1,022,978
Oklahoma	368,547
Arkansas	338,852
Georgia	337,984
Mississippi	330,080
Alabama	300,788
North Carolina	278,611
South Carolina	199,283
Louisiana	173,643
Total	3,350,766

The only States outside the Cotton Belt having more than 170,000 head of mules on farms in 1925 were Missouri, with 390,052; Tennessee, with 351,784; Kentucky, with 301,098; and Kansas, with 259,939. The total number of horses on farms in the Cotton-Belt States on January 1, 1925, was 2,239,367, or about 66 per cent as many horses as mules. The only Cotton-Belt State having more horses than mules in 1925 was Oklahoma.

[1] In the preparation of this bulletin the writer is indebted for helpful suggestions and assistance from G. A. Bell, horse-breeding expert in the Remount Service, War Department, and R. S. Whitfield, a former employee of the Animal Husbandry Division.

ADVANTAGES OF THE MULE AS A WORK ANIMAL.

The mule is a hardy work animal. While this humble creature responds to good treatment and gives best service under favorable conditions of feeding and management, it is his ability to endure hardship and to perform sterling service under adverse conditions that has established him so firmly in American agriculture. Those who are stanch supporters of the mule say that, in comparison with the horse, he will live longer, endure more work and hardship, require less attention and feed, is less liable to digestive disorders, lameness, and disease, is more easily handled in large numbers, is less irritable, and is more capable of performing work in the hands of a mediocre or poor horseman. Whether or not all these claims may be

FIG. 1.—A pair of farm mules.

substantiated, it is a fact that the mule is well established as a work animal in those sections where climatic conditions are most severe, feed less abundant, and horsemanship is not a prevailing art (Fig. 1).

SOME PECULIARITIES OF THE MULE.

The mule is an animal with possibly more eccentricities and undeniable virtues than any other domestic animal. One would naturally expect from his heritage a rather unusual temperament requiring the most thoughtful treatment. The difficulty is to know how to handle the mule in order to keep the desirable qualities of his maternal ancestry in the foreground and to keep subservient the latent donkey characteristics. To treat consistently a conglomeration of stubbornness and willingness, temper and sullenness, contentment and restlessness, slyness and docility, faithfulness and waywardness, with no knowledge of which virtue or vice is going to assert itself next, is

a problem which may well tax the qualities of the best horseman. Yet the virtues of the mule have been so evident in times of peace and war that many ardent horse lovers who have been prejudiced against him have come to admire the animal which has no "pride of ancestry or hope of posterity" (Fig. 2).

There are some peculiarities which belong to the mule alone. He does not like to be hurried, worried, or cuffed about; to try to force him to do things against his will is practically impossible and only makes matters worse. The mule must be understood and gently but firmly persuaded to do things out of the ordinary. He is naturally suspicious of everybody who comes around him, and it can be readily observed that he never takes his eye off a person near by, and when the ears begin to wag a little the person watched had better

FIG. 2.—Many mules find their way into the U. S. Army. Good, sound mules with quality are required. This illustration shows representative types of "lead" and "wheel" mules in Army service.

be on the lookout. There seems to be a code system of ear signaling among mules that they all understand. A mean mule can deftly handle his hind legs, and his forelegs are not to be ignored. He has been known to handle his "mits" in a clever fashion. The mule seems to have an uncanny way of detecting whether a person is going to treat him harshly or kindly, and his reception is usually in like manner, nor does he forget the person who inflicts harsh treatment.

There is a wrong and a right way to lead a mule. A man who looks at a mule and lugs at his head will never make any progress. The mule will not be pulled. He will usually follow quietly, however, if a man will walk away in the direction he desires to go. Neither can you "bully" mules into going through tight places; they are somewhat like sheep, and if the leader can be induced to go the rest will follow.

Next to satisfying a hearty appetite the height of mule joy is to roll. A mule will roll at every opportunity and often at inopportune times, when he makes the opportunity suit his own convenience. He dislikes mud and water holes in the road. and is what is known as a sure-footed animal.

PRODUCTION OF MULES.

The mule is a hybrid animal having a jackass, commonly called a jack, for a sire and a mare for a dam. When the reverse cross is made and the female ass (or jennet) is bred to a stallion, the off-

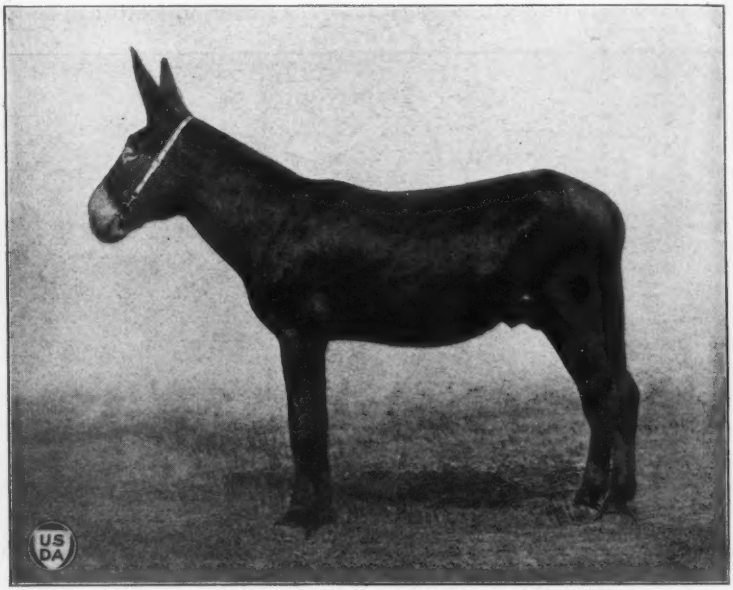


FIG. 3.—A prize-winning jack. Note size of bone and general quality throughout.

spring is called a "hinny." As the mule will not reproduce, it is necessary to maintain both jacks and mares in order to produce mules.

SELECTING THE JACK.

The importation of jacks, and consequently the production of mules, dates back to colonial times. About 1787 George Washington was presented with a jack by the King of Spain, which was used in the stud at Mount Vernon. Many good mules were produced in those days, and the value of the mule as a work animal was soon recognized by intelligent planters. It has been within the last 40 years, however, that the production of mules has been an extensive enterprise and that much attention has been given to the rearing and selection of the best jack stock.

The American jack of to-day is a composite of the bloods of some of the best foreign breeds, and in attaining the highest standard of excellence prevailing in the jack stock of America the breeders have emphasized the valuable utility points so much desired in the best jacks, such as size, weight, bone, style, quality, and action. In America jacks are usually spoken of as jennet jacks and mule jacks. As these terms imply, jennet jacks are used for mating with jennets for the reproduction of the breed, and mule jacks are used for mating with mares for the production of mules.

A good mule jack (Fig. 3) should be not less than 15 hands high and possess plenty of weight, large bone with quality, style, and action. The essential points of conformation in a good jack are a straight, strong back, closely coupled and well muscled over the loin; long and level rump; deep body and spring of rib to allow ample room for lung development. Vigor and strength of constitution are indicated by a broad chest and large heart girth.

The legs should be set straight, be well muscled, and have plenty of bone. The length of leg should be in proportion to depth of body, as height obtained by length of leg is undesirable. The size of the bone is very important and should be ample. The size of the bone is usually determined by measuring the cannon bone about half-way between the knee and the fetlock joint. This circumference should be 8½ inches in a jack of 15 hands' height. It is very desirable to have large, well-shaped feet. The head should be well proportioned, with the profile of the nose straight or slightly roman. The ears should be long, well set, and alert on a mature animal and should measure, horizontally, 33 inches or more in length from tip to tip.

Measurements of a good jack.[1]

[Weight, 1,200 pounds; height (standard measure), 15 hands, 3 inches.]

	Inches.		Inches.
Ears from tip to tip	34	Around body at girth	70
Around face and jaw	39	Around body at loin	67
Around neck at throatlatch	36	Around hoof, below coronet (next to hair)	16½
Around arm	21	Above hock	17½
Around cannon	8½	Below hock	9½
Length from poll to tail	84		

Some of the common defects in jacks which should be avoided are: Flat, narrow chest, which indicates a weak constitution and lack of vigor; light-muscled loin and long coupling; short, drooping rump; excessive length of leg; small feet with contracted heels; and short or droopy ears.

CARE OF THE JACK.

The proper care and management of the jack are somewhat exacting, as he is rather peculiar in his likes and dislikes. While a stallion may be spoiled because of his nervous temperament, the jack may be just as quickly spoiled because of his inclination to be sluggish. The jack should have a caretaker who understands jack man-

[1] Twice champion at the Missouri State Fair and reserve champion at the World's Fair, San Francisco.

agement thoroughly. This is very important, as the disposition of the jack is partly controlled by the groom. The jack should be quietly but firmly handled, as a bad disposition in a jack is usually attributable to harsh handling or mismanagement of the animal when young. Through continuous observation the groom should learn the peculiar individuality of the jack and the little things required for his proper management.

Abundant exercise is one of the big factors in the management of a breeding animal. A roomy, well-ventilated, and well-lighted box stall opening to an exercising paddock is necessary for the proper care of the jack. It is important that the exercising paddock be of good size. In order to insure plenty of exercise, however, it is well to give the jack some road work.

A young jack intended for siring mules should not be permitted to run with jennets or mules, as this practice usually leads to difficulty in teaching him to serve mares, when used in the stud. Instead the young jack should have fillies or gentle mares for companions. The jack may begin serving mares at the age of 2 or 2½ years, but he should not serve more than one mare a day during his first season nor more than 30 for the entire season. A mature jack may serve as many as two mares in a single day provided the two services are several hours apart. The number of mares a jack should serve during a season depends on the strength and vigor of the individual, but 70 or 80 mares probably is the maximum number that he can serve with satisfactory results. Artificial breeding may be employed if the jack is patronized very heavily. This not only conserves the vitality of the jack but also enables the owner to breed a much larger number of mares. If care and precaution are taken, artificial breeding may be practiced with as much success as breeding in the natural way. In fact, some mares which do not conceive from natural service are successfully impregnated artificially. It is sometimes advisable to use a stallion for teasing purposes in order to conserve the jack when the patronage is heavy.

FEEDS FOR THE JACK.

The jack is a rather sluggish animal, and for this reason his feeds should be slightly laxative in character. Bran, oats, crushed barley, and oil meal are splendid grain feeds to use. Sheaf oats and green feeds are also very satisfactory. Corn should be used only in limited amounts. Many jack breeders obtain good results by feeding sheaf oats, clover, and alfalfa hay.

THE BROOD MARE.

Sound brood mares of good quality should be selected in order to be successful in producing high-grade mules. Considerable effort is usually expended by the breeders of work horses in selecting good mares for breeding purposes, but no consistent effort is usually made by the mule breeder in exercising the same care in selecting brood mares for the production of mules. The idea seems to prevail that

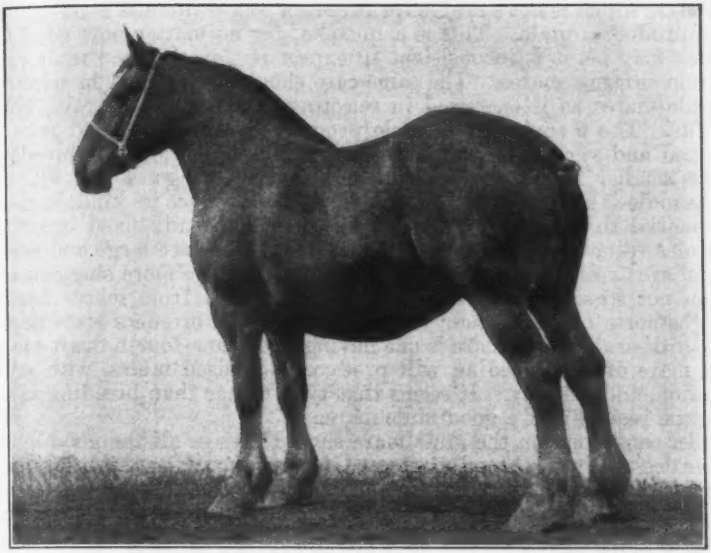


FIG. 4.—A desirable type of brood mare for producing draft mules. Note the "breediness," substance, and conformation of this mare.

FIG. 5.—A desirable type of light "mule mare" for producing mules of quality. Note roominess of body, short back, depth of heart girth, and "breediness" of this mare.

a mare which is not suitable for breeding to a stallion is good enough to produce a mule. This is a mistake, for no matter how good the jack may be, it is inconsistent to expect uniformly good mule colts from inferior mares. The same care should be applied in selecting mule mares as is exercised in selecting brood mares to raise horse colts. The mares used in mule production are of no fixed type or breed and vary from the large, heavy mares of the draft breeds to the smaller mares of the light-horse breeds (Figs. 4 and 5). As the mule is a work animal which can not reproduce its kind, it is not essential that mares for producing them be of any fixed breeding. Mules from the larger mares of the draft breeds are large and heavy and are excellent for draft purposes, but they are more sluggish and can not stand heat so well as mules produced from mares having light-horse blood in their veins. Experienced breeders state that a very desirable mule mare is one having about one-fourth draft blood. A mare of this breeding will produce good-sized mules, with style, action, and stamina. It seems that type rather than breeding is the prime requisite of a good mule mare.

In conformation the mule mare should possess all the good qualities desired in the brood mare used for producing good work horses. Some of the most important points of the good mule mare are:

A broad chest and large heart girth, indicating a vigorous constitution; a roomy barrel to allow for full development of the fetus; a straight back, strongly muscled over the loins; well-set legs with broad, flat bone, sound and of good quality; large and well-shaped feet; and feminine character, indicating "breediness." To sum up, the mare should combine size with quality, type, soundness, and breediness. The last term includes a variety of characteristics which makes the mare a good mother.

BREEDING THE MARE.

The mare will come in heat, on an average, every 18 to 21 days and will remain in heat from 2 to 4 days, though exceptional mares vary in this respect and remain in heat only a few hours. The mare usually comes in heat on the ninth day after the foal is dropped. In order to avoid accidents at breeding time, hobbles should always be put on the mare. Conception is more likely to take place if the mare is rested for a few hours at time of service. The mare should be returned to the jack in from 18 to 21 days after service, in order to make sure that conception has taken place.

TABLE 1.—*Calendar showing time of service and date of foaling based on 340-day gestation period for mares.*

Day of month mare is bred.	Date of foaling.											
	Bred in Jan.	Bred in Feb.	Bred in Mar.	Bred in Apr.	Bred in May.	Bred in June.	Bred in July.	Bred in Aug.	Bred in Sept.	Bred in Oct.	Bred in Nov.	Bred in Dec.
	Dec.	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May.*	*June.*	*July.*	*Aug.*	*Sept.*	*Oct.*	*Nov.*
1	6	6	3	6	5	6	5	6	6	5	6	5
2	7	7	4	7	6	7	6	7	7	6	7	6
3	8	8	5	8	7	8	7	8	8	7	8	7
4	9	9	6	9	8	9	8	9	9	8	9	8
5	10	10	7	10	9	10	9	10	10	9	10	9
6	11	11	8	11	10	11	10	11	11	10	11	10
7	12	12	9	12	11	12	11	12	12	11	12	11
8	13	13	10	13	12	13	12	13	13	12	13	12
9	14	14	11	14	13	14	13	14	14	13	14	13
10	15	15	12	15	14	15	14	15	15	14	15	14
11	16	16	13	16	15	16	15	16	16	15	16	15
12	17	17	14	17	16	17	16	17	17	16	17	16
13	18	18	15	18	17	18	17	18	18	17	18	17
14	19	19	16	19	18	19	18	19	19	18	19	18
15	20	20	17	20	19	20	19	20	20	19	20	19
16	21	21	18	21	20	21	20	21	21	20	21	20
17	22	22	19	22	21	22	21	22	22	21	22	21
18	23	23	20	23	22	23	22	23	23	22	23	22
19	24	24	21	24	23	24	23	24	24	23	24	23
20	25	25	22	25	24	25	24	25	25	24	25	24
21	26	26	23	26	25	26	25	26	26	25	26	25
22	27	27	24	27	26	27	26	27	27	26	27	26
23	28	28	25	28	27	28	27	28	28	27	28	27
24	29	29	26	29	28	29	28	29	29	28	29	28
25	30	30	27	30	29	30	29	30	30	29	30	29
26	31	31	28	31	30	31	30	31	31	30	31	30
	Jan.	*Feb.*	*Mar.*	*Apr.*	*May.*	*June.*	*July.*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
27	1	1	1	1	1	1	1	1	1	1	1	1
28	2	2	2	2	2	2	2	2	2	2	2	2
29	3	.....	3	3	3	3	3	3	3	3	3	3
30	4	.....	4	4	4	4	4	4	4	4	4	4
31	5	.....	5	.....	5	.....	5	5	.....	5	.....	5

CARE OF THE PREGNANT MARE.

There should be no sudden changes in feed or work of the mare after she becomes pregnant. She should be given a well-balanced ration of feed that will supply the needs of her own body as well as those of the growing fetus. Feeds that are too fattening should be avoided, also moldy or damaged hay, as there is a suspicion that either may cause abortion. Exercise is a most important essential to the health of the pregnant mare, as well as for the development of a strong, healthy foal. The best and most economical way of giving this exercise is by using the mare in regular farm work. The pregnant brood mare should not be subjected to hard pulls or severe strains. By using care and judgment the mare may be safely worked up to within a week or ten days of foaling. The average gestation period of mares—that is, the length of time that they carry their foals—is about 340 days. This period varies slightly with individual mares. It is important that a careful record be kept of the date of service to the jack in order that the time of foaling may be anticipated. A very sure sign that the foal will be dropped in a short while is the appearance of wax on the teats, which usually appears two or three days before parturition.

CARE OF MARE AT FOALING TIME.

About a week or ten days before the foal is expected the mare should be turned into a pasture or paddock, where there is no danger of injury from other animals. If the weather is mild, a paddock or pasture is a desirable place for the foal to be delivered. There is probably less danger of infection in a pasture than in a stable. If desirable conditions for foaling outside can not be provided for, a roomy box stall that has been well cleaned out, disinfected, and bedded with fresh straw should be provided.

It is well to observe the mare closely when the foal is expected, in order that assistance may be given in delivery if necessary. It will be necessary for the attendant to be where he can see the mare and yet be unseen by her. Should she need assistance, a veterinarian should be summoned at once. If it is essential that aid be given, the service should be rendered by one who has had experience with and understands the many phases of difficult parturition.

If the foal has been delivered satisfactorily, the attendant should remove as soon as possible any tissue or matter that may be clogging its nostrils and see that respiration is started. Assistance may be rendered in this respect by blowing into the foal's nostrils and rubbing its sides with a cloth or wisp of straw. As soon as practicable, without disturbing the mare unnecessarily, remove the afterbirth from the proximity of the mare and, if foaling occurred in a stable, clean out the bedding that has been soiled during parturition, sprinkle lime on the floor where the bedding has been removed, and supply fresh bedding.

To prevent infection, the navel cord of the foal should be saturated with full-strength tincture of iodin or a solution of 1 to 1,000 corrosive sublimate, and then dusted with powdered slaked lime. This should be repeated each day until the navel cord drops off. A normal foal will usually find its own way to the mare's udder soon after arrival. If, however, the foal is weak and unable to stand within two or three hours after birth, it should be assisted in getting its first meal. It is very important that the newborn foal get the first milk from its dam, which is a substance called colostrum. In addition to having the food properties so much needed by the new born, the colostrum also has a purgative effect, which stimulates the action of the digestive tract in eliminating the fecal matter already collected during the period of gestation. If this fecal matter is not eliminated within 24 hours after the colt is born, a dose of castor oil (2 to 4 tablespoons) shaken well in milk should be given and repeated in three or four hours until the desired results are obtained.

CARE OF MARE AND FOAL.

The mare should receive bran mashes and light feeds until she has recovered from the effects of foaling and the feverish condition of her system has disappeared. The ration should then be increased gradually until the mare is on full feed.

When the weather is warm and pleasant, the mare and foal may be turned out on pasture or paddock as soon as the foal is able to follow, as exercise is very beneficial and they will thrive better in the open.

If the mare was being worked prior to foaling, she will be ready for work again in 10 days or two weeks after the colt is born. When this is done the colt should be confined in a stable or paddock and not permitted to follow in the fields. The mare and colt will fret for each other for a while, but they will soon become accustomed to separation. When working, the mare should be returned to the stable once in the forenoon and in the midafternoon to allow the colt to suckle. The mare should be allowed to cool before being turned in with the colt, as there is danger of causing the colt to have scours and other digestive troubles if the mare is overheated when nursing.

When the mare is idle during the fly season, it is best to keep her and her foal in a darkened stable in the day and turn them out on pasture at night. The mare should be fed some grain and hay, as grass alone will not supply the needs of her body and also provide a sufficient milk flow for the colt.

The colt usually begins to eat a small amount of grain at the age of three or four weeks. Oatmeal should be the first grain fed and bran may be added later. Best results in feeding grain to colts in the open are obtained by building a creep under which they may pass at all times and which will prevent the mares or other mature horses from reaching the feed provided for the colts. The colt will eat only a little grain at first, but it is worth much to have it begin eating a small amount as soon as possible, because the more accustomed it becomes to eating grain while young the less trouble there will be at weaning time. The mare may be induced to frequent the creep by giving her an occasional feed near there also.

WEANING THE COLT.

Under ordinary conditions the colt is usually weaned when about six months old, but if the mare is working and the colt is thrifty it may be weaned earlier. When the colt has been taught to eat grain early, this separation from its dam need not cause any check in the colt's development. This is a trying time in the life of a colt, however, and it should receive additional feed and care to make up for the loss of the mother's milk from its ration. When the colt is once taken away from the mare, the separation should be made complete.

The mare requires some individual attention at weaning time. It will be necessary to milk her by hand for a few days to prevent too much milk from collecting in the udder and causing it to become caked and swollen. To assist in the drying-up process, the mare should be milked only partially dry and if the milk flow is maintained the grain ration should be reduced for a few days.

CARE OF THE COLT AFTER WEANING.

At no time in the colt's life is pasture more important than at the time of weaning. On being taken away from its dam, the colt needs succulent feed and the best way of supplying this feed is by having a good pasture. Not only is a good pasture necessary for the development of the colt, but it is also necessary if the colt is to be raised in an economical manner. In addition to the pasture the colt should

receive liberal amounts of grain and hay. Half of its growth is made during its first year and it should have every advantage possible for its development. Colts like companionship and they do better if several are allowed to run together (Fig. 6).

THE ORPHAN COLT.

It may happen sometimes that the mare dies soon after foaling or fails to give milk enough for her foal. When either of these misfortunes occurs the colt must be raised by hand, which is a tedious undertaking but is worth while if done properly. As a feed for the orphan colt, the best and most practical substitute for mare's milk is cow's milk after it has been prepared to conform as nearly as possible

FIG. 6.—Mule foals like companionship. A group of weanlings on pasture.

in composition to the milk of the mare. This is done by selecting milk that is low in butterfat and diluting it with one part of fresh water for three parts of milk. Add a tablespoon of sugar and three or four tablespoons of limewater to a pint of this diluted milk and heat to body temperature. Give the foal about a half teacup of this prepared milk at first and at short intervals gradually increase the amount and the length of time between feeding periods as the foal develops. A bottle with a rubber nipple attached is the most convenient way to give milk to the orphan. As the foal suckles frequently in small amounts when following its dam, one should feed it frequently and thus conform as nearly to natural conditions as possible.

The utensils used in feeding the orphan foal should be kept scrupulously clean. This can be done by freely utilizing hot water and sunshine, both of which are enemies to germs that collect and thrive in milk containers.

SPRING OR FALL COLTS.

The climatic conditions and nature of the farm work determine largely whether it is best to have the colts come in the spring or in the fall.

The natural breeding season for mares is in the spring, which is the generally accepted time to have colts. There are, however, several advantages of having fall colts, especially in the South. The fall-born colt comes at a time when the mare can probably be more easily spared from farm work and at a time when flies are not so abundant. Another advantage is that the fall colt is weaned at a time when it can be turned on to pasture and its development is not retarded at this critical time. The spring colt is weaned at a time when the grazing season is practically over.

EDUCATING THE COLT.

The time to begin the education of the colt is early in its life. It should be halterbroken and taught to be led when a few weeks old. The more the colt is handled when young the fewer difficulties will be encountered later when it is desired to put him to work.

Mules reach maturity at the age of 5 years, but they may be given light work when 3 years old. Care should be taken not to overload young mules. Overtaxing the young animal not only tends to check its development but also causes it to become unreliable as a worker, and possibly balky. A young mule that becomes accustomed to moving a load every time it is called upon will develop into a reliable work animal.

FEEDING AND CARE OF MULES.

Too little thought and attention are usually given to the proper methods of management and feeding of mules. Where the use of mules as work stock prevails, the feeding is usually done in a haphazard manner without regard to efficiency and economy. The essentials of a good caretaker are judgment and common sense combined with some knowledge of feeds. The most practical feeds to use are those which are grown on the farm or plantation so far as they provide the essential nutrients for a balanced ration. Corn, oats, and barley are the most widely used grains, as there is hardly a section of the United States where one or more of these grains are not grown. These grains may be combined to make a satisfactory feed or taken singly and supplemented with such feeds as bran, oil meal, or cottonseed meal to make a balanced ration. A balanced ration is one which will supply the protein and carbohydrate elements in such proportion as to meet as nearly as possible the body requirements of the animal for doing the work which it is to perform.[2] The same principles that are used in the correct feeding of horses may also be applied to the feeding of mules. As a general rule 1.1 pounds of grain and 1¼ pounds of hay daily per 100 pounds of live weight will be found to be about the right amount of feed to use for an animal at medium work. The exact

[2] Methods of computing a balanced ration are fully explained in Farmers' Bulletin 1030, Feeding Horses, which may be obtained on request from the Division of Publications, Department of Agriculture, Washington, D. C.

quantity of feed depends upon the individual animal and must be determined by the feeder.

While there are many cases in which mules are underfed, there are probably many others in which the owner suffers financially because the mules are fed more high-priced feeds than they really need, through the use of improperly balanced rations. Overfeeding is most likely to be done during the winter months, when the mules are idle. During this period idle mules may be kept in good condition largely on hay and straw and a small amount of grain. Mules that are worked hard and are receiving heavy rations should have their feed allowance diminished when idle. Idle mules thrive better if they are not confined in stables but are kept in the open.

Digestive disorders are more prevalent among work stock during the spring and summer months than at any other time. This is due to the improper feeding and watering of overheated animals. If the work animal appears to be excessively warm when brought in from work, it should be permitted to cool off before watering or feeding. Attention to such details will prevent many cases of colic. Mules sometimes suffer in hot weather from heat because they are allowed to eat too much grain or hay. This is most likely to occur when fresh, new hay is being fed. The hay ration should be fed mainly at night so that there will be several hours in which the mule may partly digest and assimilate this bulky feed before going to work.

Mules like to roll after being unharnessed, and they should have a place where they may rest themselves in this way. They will be much more comfortable in summer if they are turned out of their stables at night after they have cleaned up their feed. If they are turned on to pasture at night they will sweat more the next day, but the beneficial effects obtained from the grass and being in the open will more than offset the effects of excessive sweating. If unable to provide pasture for the mules at night during the summer, a paddock or lot should be provided where they may be comfortable.

JUDGING MULES.

The general form and appearance of the mule should resemble closely that of a horse, and in judging mules the same general points of perfection are looked for. The nearer the mule approaches the ideal desired in a draft horse the more valuable he is from a market standpoint. In the mule there are certain characteristics derived from his paternal side which are mainly indicated in his bray, disposition, ears, tail, and feet, aside from which the mule does not differ materially from the dam.

Mules vary in height from the little 12-hand pit mules to the large draft mules standing 17½ hands. The range in height of various classes of mules is given in another portion of this bulletin under "Market classes of mules."

The weight of mules varies from 600 pounds to 1,600 pounds. The average weight of the larger type of mules varies between 1,150 and 1,400 pounds and is the range of weight within which the majority of the most marketable mules are classified.

The form of the mule should be compact, with a deep body, broad chest, full flanks, short back, and well-sprung ribs. Light, waspy flanks, long narrow bodies, and long backs are not desirable.

Quality is rather difficult to define, but is that which every capable judge looks for in any animal. It is indicated in a mule by a trim, fine ear, clean-cut head and joints, flinty flat bone, well-defined tendons, and soft, silky hair. Quality marks the difference between a "market topper" and a "jar head." A short, thick ear, a coarse head, round, spongy bone, and a harsh coat of hair are indications which the judge should discriminate against.

The natural tendency of the mule is to be lazy and obstinate. An active, energetic mule is much desired.

It is in the hind quarters of the mule that the greatest faults of conformation are usually found. The croup is often very short

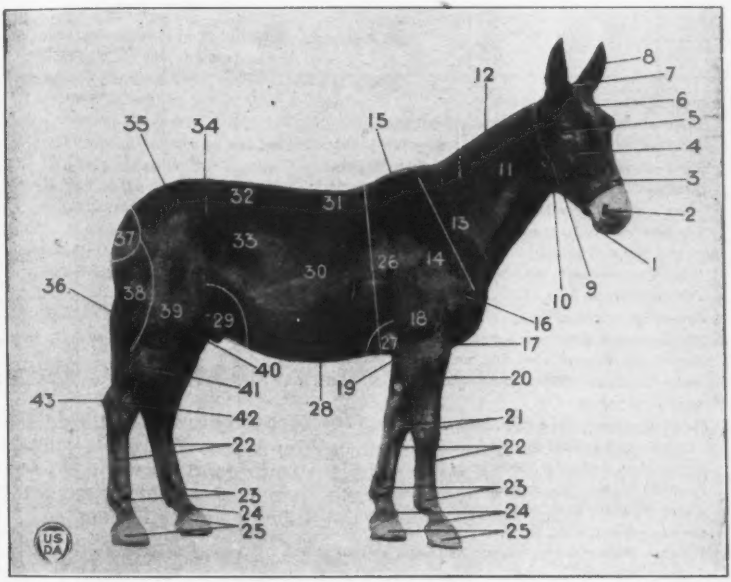


FIG. 7.—The points of the mule: 1, mouth; 2, nostril; 3, nose; 4, face; 5, eye; 6, forehead; 7, poll; 8, ear; 9, lower jaw; 10, throatlatch; 11, neck; 12, crest; 13, shoulder bed; 14, shoulder; 15, withers; 16, point of shoulder; 17, breast; 18, arm; 19, elbow; 20, forearm; 21, knees; 22, cannons; 23, fetlocks; 24, pasterns; 25, feet; 26, heart girth; 27, fore flank; 28, underline; 29, hind flank; 30, barrel; 31, back; 32, loin; 33, coupling; 34, hip; 35, croup; 36, tail; 37, buttock; 38, quarters; 39, thigh; 40, stifle; 41, gaskin; 42, hock; 43, point of hock.

and steep, the hips sloping, the thighs narrow, and the hind legs sickle shaped. These are faults of conformation that judges should discriminate against sharply. It is in the hind quarters and loins that the draft animal obtains propelling power. These portions of the animal, therefore, should be correctly built and properly developed. The loins should be broad, short, and thickly muscled; the croup long and level; the hips long, level, and muscular; the thighs thick,

long, and well muscled; and the hind legs well set, with broad, clean-cut hocks and flat, dense bone. The mule should stand on good feet that are well shaped.

While the mule is essentially a draft animal, it is used widely for general utility purposes, especially in the South. Though style and action may not be so important qualities in a mule as they are in the lighter breeds of horses, these qualities add materially to its value. A smart, alert mule, with a long, free stride at the walk and a snappy, balanced trot is highly desired. Figure 7 and the accompanying score card give points in the study of conformation.

Score Card for the Mule.

Scale of points.	Standard score.	Points given animal judged.	
		Student's score.	Corrected score.
GENERAL APPEARANCE—16 points:			
Height—Estimated hands....; actual hands.....			
Weight—Estimated....; actual....; according to age and type....	4		
Form—Broad, deep, compact, smooth, symmetrical.....	4		
Quality—Clean, dense bone with sufficient substance; refined head and ears; fine hair; defined joints and tendons.....	4		
Temperament—Active; good disposition.....	4		
HEAD AND NECK—7 points:			
Head—Proportionate; clear-cut features.....	1		
Forehead—Broad, full.....	1		
Eyes—Full, bright, clear.....	1		
Muzzle—Broad, fine; large nostrils; trim and even lips.....	1		
Ears—Large, long, pointed, fine, well set, carried alert.....	1		
Neck—Long, muscular, clean-cut throatlatch.....	2		
FOREHAND—24 points:			
Shoulders—Long, sloping, smooth, muscular, blending into smooth, well-defined withers.....	3		
Arms—Short, muscular, elbow in.....	1		
Forearms—Long, wide, muscular.....	2		
Knees—Straight, wide, deep, well supported.....	2		
Cannons—Short, wide, flat, well-defined tendons.....	2		
Fetlocks—Wide, straight, tendons well back, well supported.....	1		
Pasterns—Of medium length, oblique (about 45°), clean, strong..	3		
Feet—Of medium size, set straight; dense, smooth horn; slope of wall parallel to pastern; wide, high heels; concave sole; strong bars; prominent, elastic frog.....	6		
Leg position—In front, a perpendicular line from point of shoulder should divide the leg and foot into lateral halves; from the side, a similar line from the bony prominence on shoulder blade should pass through the center of elbow, knee, and pastern joints, and meet the ground back of foot.....	4		
BODY—9 points:			
Chest—Deep, wide.....	2		
Ribs—Long, well sprung, close.....	2		
Back—Short, broad, strong.....	2		
Loin—Short, wide, muscular.....	2		
Flanks—Deep, full; long, low underline.....	1		

Score Card for the Mule—Continued.

Scale of points.	Standard score.	Points given animal judged.	
		Student's score.	Corrected score.
HIND QUARTERS—32 points:			
Hips—Wide, level, smooth, muscular	2		
Croup—Long, level, muscular	2		
Tail—Set high, well carried	1		
Quarters and thighs—Deep and muscular; strongly joined to gaskins	3		
Stifles—Broad, thick, strong	1		
Gaskins—(Lower thighs) long, wide, muscular	2		
Hocks—Straight, wide, prominent points, deep, flat, clean-cut, well supported	6		
Cannons—Similar to front, but a trifle longer and wider	2		
Fetlocks—Wide, straight, tendons well back	2		
Pasterns—Similar to front, but less sloping (about 55°)	3		
Feet—Similar to front, but not quite as large	4		
Leg position—From rear, a perpendicular line from point of buttock should divide the leg and foot into lateral halves; from the side, this same line should touch the point of hock and run parallel to the cannon. A similar line from hip joint should meet the ground midway between heel and toe	4		
ACTION—12 points:			
Walk—Active, straight, balanced, long stride	7		
Trot—Straight, long, free, regular, snappy stride	5		
Total	100		

MARKET CLASSES OF MULES.

Mules are classified according to their use. There are many local market classifications of mules, but they may be grouped into five general classes. Each class includes mules of a general type, while there are various grades and weights within a specific class.

The general classes of mules are shown in the table.

TABLE 2.—*Ranges in height and weight of various classes of mules.*[a]

Class.	Range in height.	Range in weight.
	Hands.	*Pounds.*
Draft	16 to 17½	1,200 to 1,600
Farm	15½ to 16	900 to 1,250
Sugar	16 to 17	1,150 to 1,300
Cotton	13½ to 15½	750 to 1,100
Mining	12 to 16	600 to 1,350

Each of the classes is graded according to conformation, soundness, quality, condition, and action into the following grades: Choice, good, medium, common, inferior.

[a] Market Classes and Grades of Horses and Mules. Bulletin 122, Illinois Agricultural Experiment Station, 2d ed. 1912.

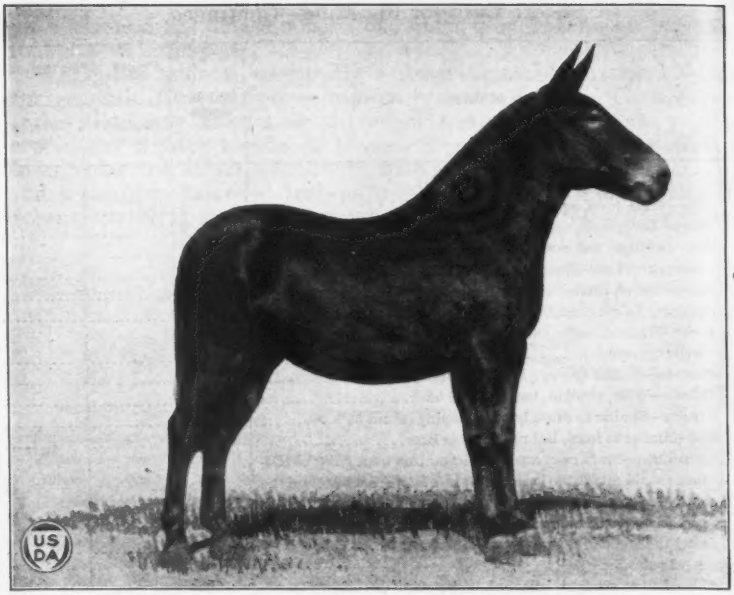


FIG. 8.—A choice draft mule. Champion mule at American Royal Livestock Show, Kansas City, Mo., 1922.

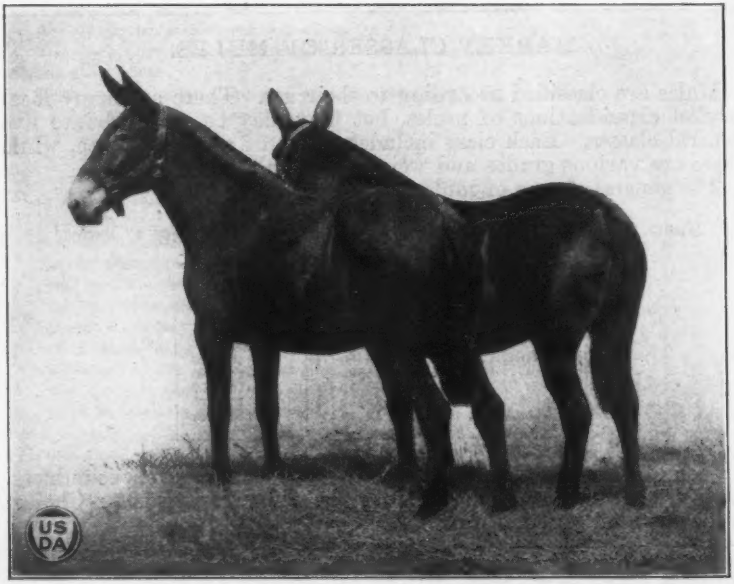


FIG. 9.—A pair of choice draft mules.

DRAFT MULES.

The draft-mule class includes the largest mules (Figs. 8, 9, 10), standing from 16 to 17½ hands and weighing from 1,200 to 1,600 pounds. Some exceptional draft mules exceed the maximum weight given for this class. They are used largely for heavy teaming in large cities, especially in the warmer climates; for contract jobs, such as road grading and railroad work; and for lumber work. Mules for contract work are usually designated by an appropriate descriptive name, such, for instance, as "railroaders." The heaviest draft mules find their way to the lumber camps. Contract mules

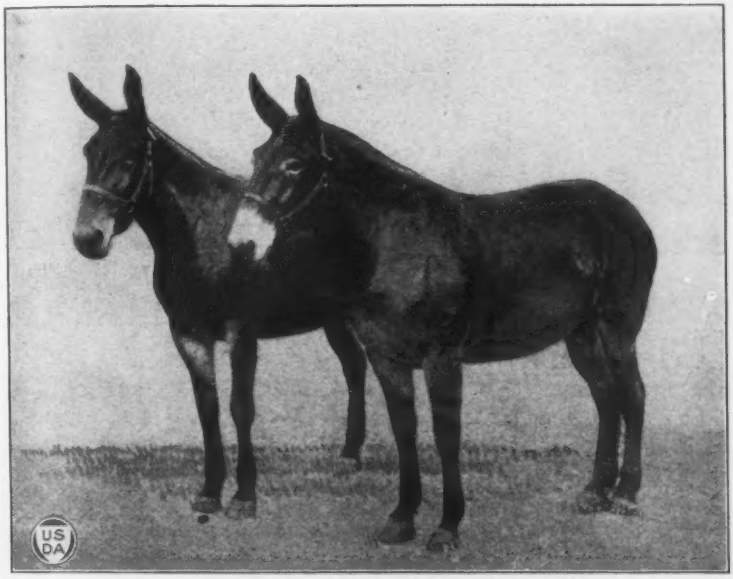


FIG. 10.—A pair of good draft mules.

must have more quality than lumber mules, but extreme weight is not so essential. The greatest demand for draft mules is for those between the ages of 5 and 8 years.

There is no special preference in regard to sex. The highest prices paid are for those mules having weight combined with heavy bone, large, well-shaped feet, strong, short backs, closely coupled with abundant muscling over the loin and hind quarters.

FARM MULES.

Mules purchased in the market for farm work in the Middle Western States are known as "farm mules." There is more variation in quality and type in this class than in any other class, as the demand for a specific type is not so well defined (Figs. 11, 12, 13, 14).

FIG. 11.—A pair of large farm mules.

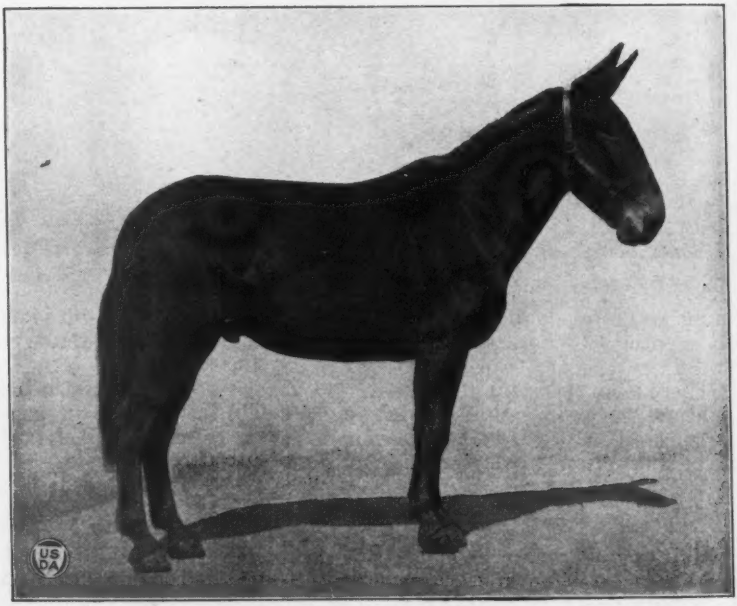


FIG. 12.—A good farm mule.

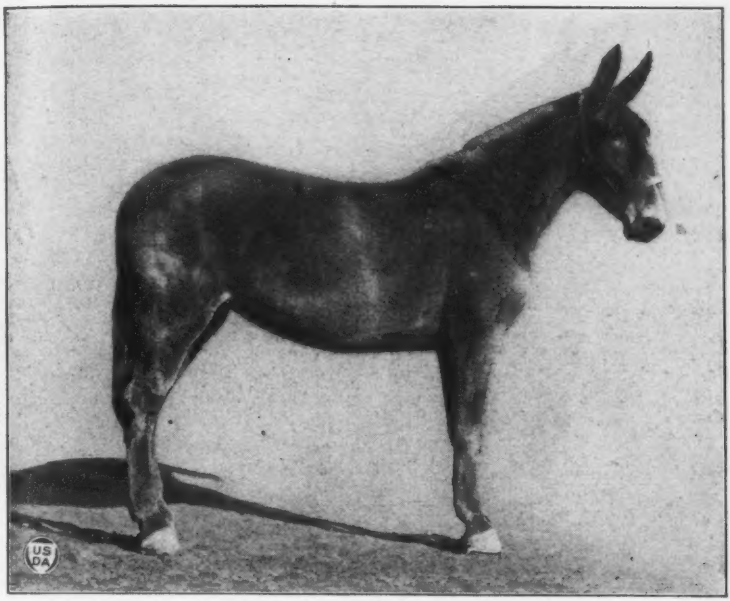


FIG. 13.—A medium farm mule.

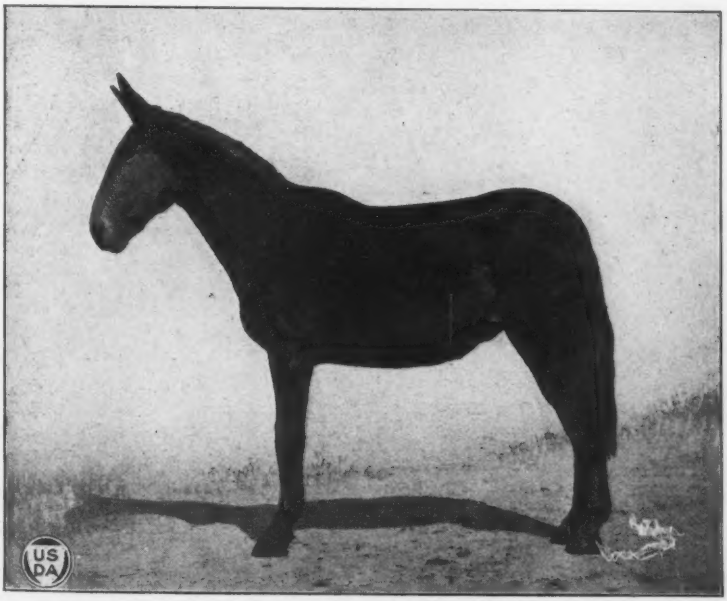


FIG. 14.—Common farm mule.

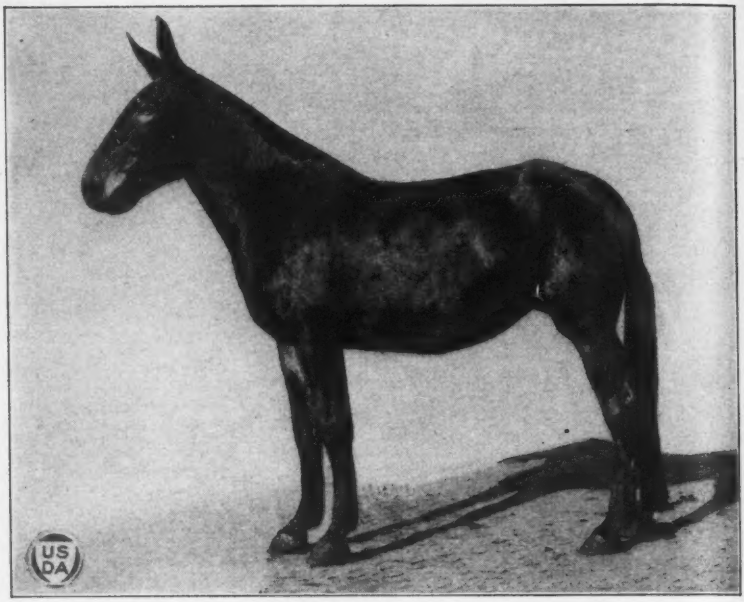


FIG. 15.—A choice sugar mule.

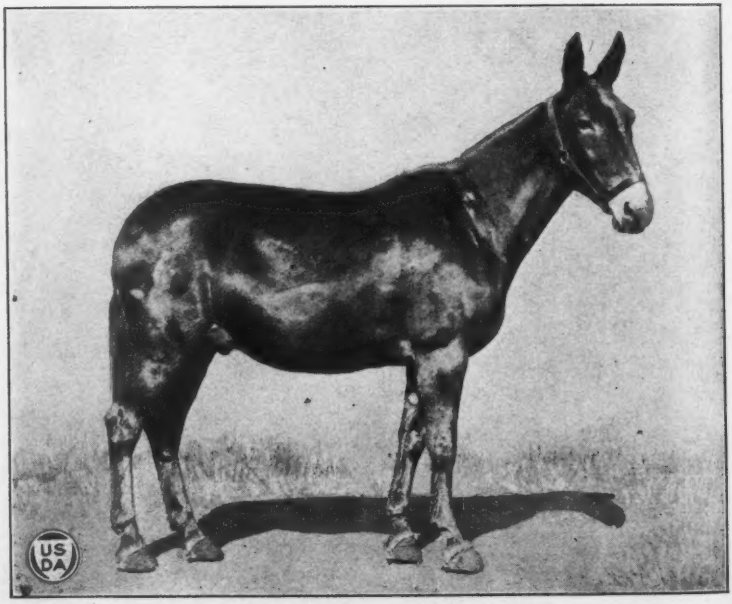


FIG. 16.—A good sugar mule.

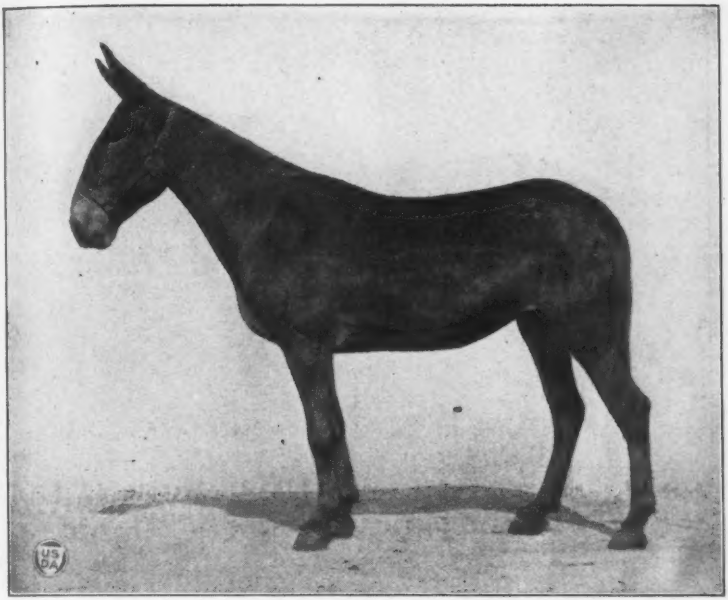


FIG. 17.—Common sugar mule.

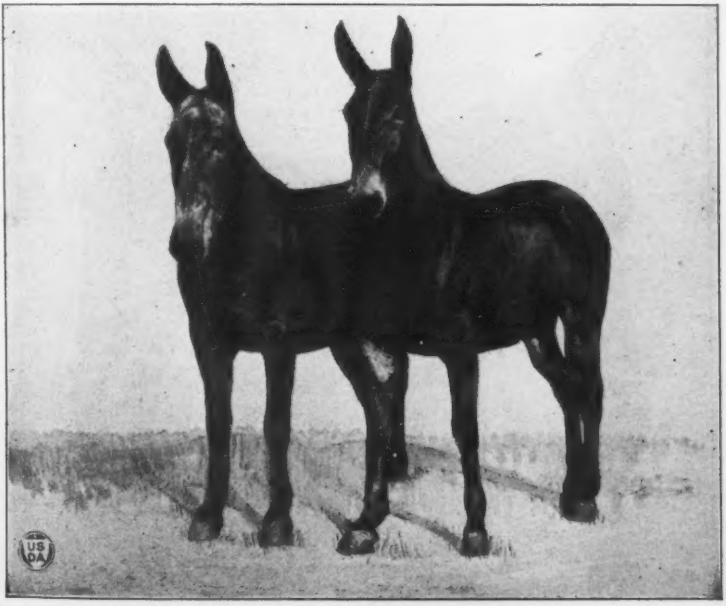


FIG. 18.—A team of choice cotton mules.

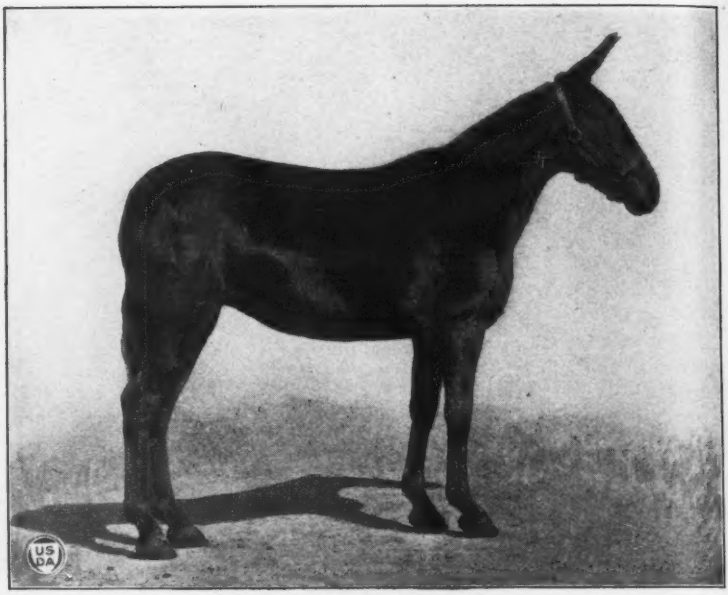


FIG. 19.—A good cotton mule.

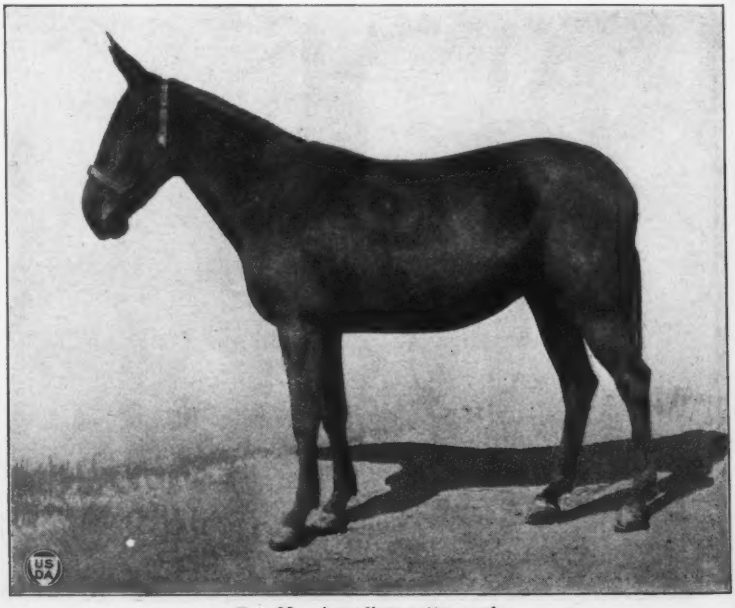


FIG. 20.—A medium cotton mule.

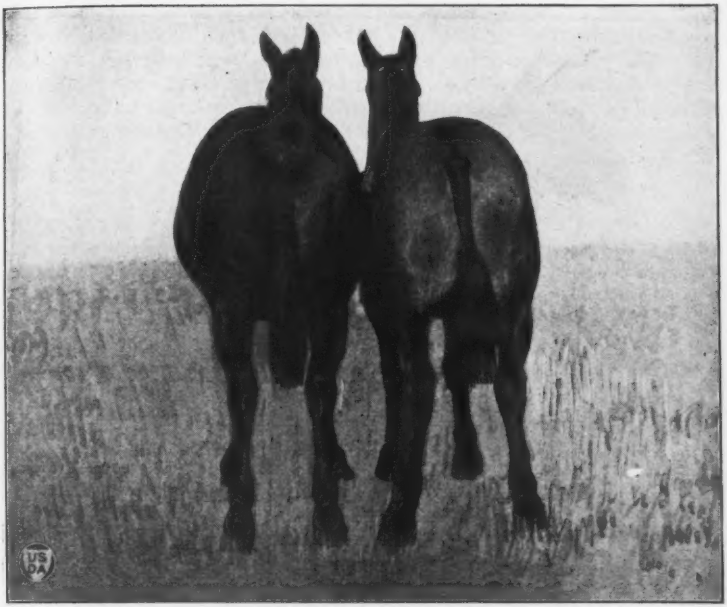


FIG. 21.—A team of choice surface mining mules.

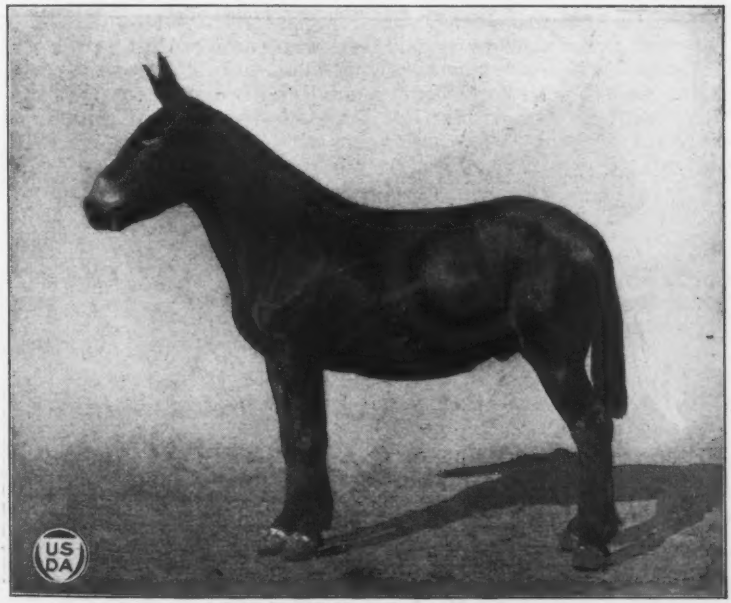


FIG. 22.—A choice surface mining mule.

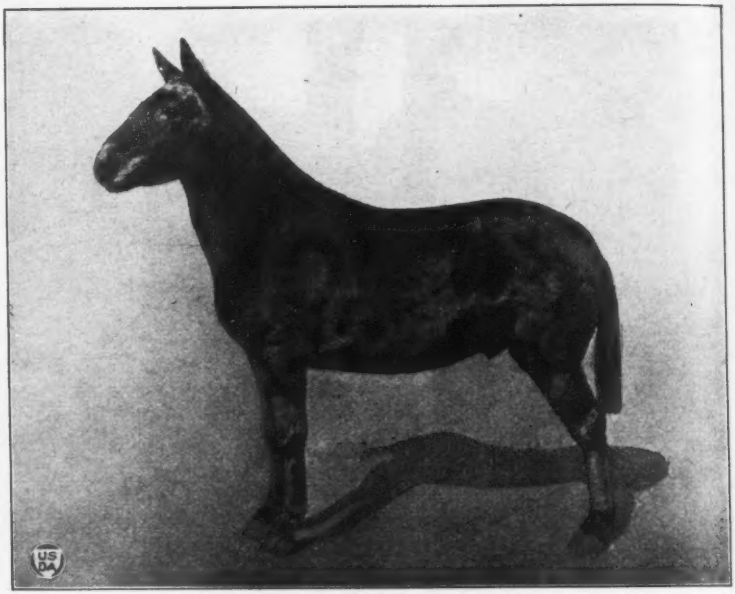


FIG. 23.—A choice pit mining mule.

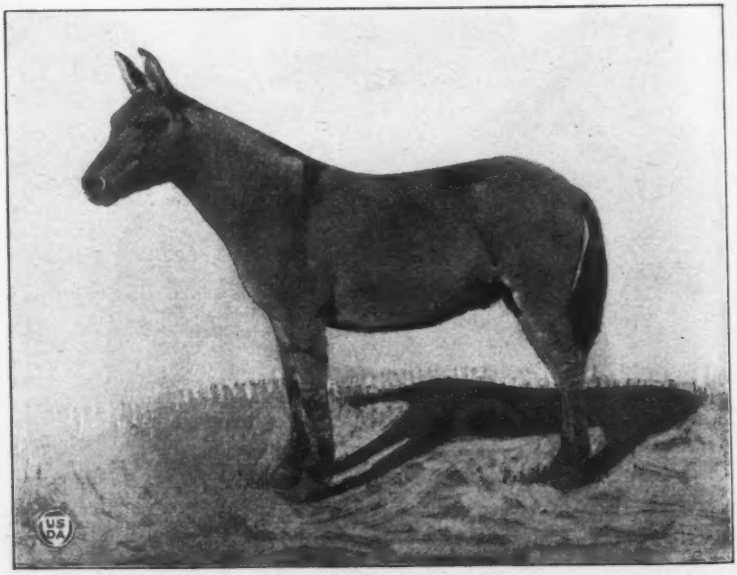


FIG. 24.—A good pit mining mule.

Mules in this class may be plain draft mules or cotton mules that lack finish and condition, as the farmer likes to buy mules with a prospect of developing them into more valuable animals. Many of them are worked for a season and then fitted for the market, where they are placed into one of the other specific classes, such as "drafters," "sugar mules," "cotton mules," "miners," or "railroaders."

SUGAR MULES.

Sugar mules are those which are purchased for shipment to the sugar plantations of the South. This class of mules is somewhat rangy in type and should have quality, style, and finish. The mules in this class are heavier and more compact than cotton mules, but not so heavy as draft mules. The range in weight is from 1,150 to 1,300 pounds. In selecting sugar mules special attention should be given to quality and adaptability to the work. The feet should be large and well shaped. Mare mules are preferred for the sugar trade (Figs. 15, 16, 17).

COTTON MULES.

As the name implies, cotton mules are purchased for cotton plantations. The type (Figs. 18, 19, 20) is somewhat lighter and more angular than the sugar or surface-mining mule and heavier than the pit mule. While there is a gradation of quality and age in this market class, the planters of the South are becoming more and more inclined to increased weight and quality in their mules than prevailed a few years ago. A choice cotton mule weighs about 1,150 pounds and is alert and active, but most mules in this class vary from 750 to 1,100 pounds. The custom in the Cotton Belt is to buy mules in the spring for the crop season and dispose of them in the fall. As they are usually in poor condition following the heavy summer's work, they are sold in the fall for a fraction of the purchase price. These mules are wintered, fattened, and sold back to the planter in the spring. For this reason the age limits within this class are variable. Mules from 5 to 7 years old are preferred, however, for this trade and bring the best prices.

MINING MULES.

There is a wide range in weight among mining mules, varying from 600-pound pit mules to 1,350-pound surface mules (Figs. 21, 22, 23, 24). Good feet and freedom from blemishes are requirements for mules to qualify for top prices for the mining trade.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

July 1, 1930

Secretary of Agriculture	ARTHUR M. HYDE.
Assistant Secretary	R. W. DUNLAP.
Director of Scientific Work	A. F. WOODS.
Director of Regulatory Work	WALTER G. CAMPBELL.
Director of Extension Work	C. W. WARBURTON.
Director of Personnel and Business Administration.	W. W. STOCKBERGER.
Director of Information	M. S. EISENHOWER.
Solicitor	E. L. MARSHALL.
Weather Bureau	CHARLES F. MARVIN, *Chief.*
Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Bureau of Dairy Industry	O. E. REED, *Chief.*
Bureau of Plant Industry	WILLIAM A. TAYLOR, *Chief.*
Forest Service	R. Y. STUART, *Chief.*
Bureau of Chemistry and Soils	H. G. KNIGHT, *Chief.*
Bureau of Entomology	C. L. MARLATT, *Chief.*
Bureau of Biological Survey	PAUL G. REDINGTON, *Chief.*
Bureau of Public Roads	THOMAS H. MACDONALD, *Chief.*
Bureau of Agricultural Economics	NILS A. OLSEN, *Chief.*
Bureau of Home Economics	LOUISE STANLEY, *Chief.*
Plant Quarantine and Control Administration	LEE A. STRONG, *Chief.*
Grain Futures Administration	J. W. T. DUVEL, *Chief.*
Food, Drug, and Insecticide Administration	WALTER G. CAMPBELL, *Director of Regulatory Work, in Charge.*
Office of Experiment Stations	———, *Chief.*
Office of Cooperative Extension Work	C. B. SMITH, *Chief.*
Library	CLARIBEL R. BARNETT, *Librarian.*

U. S. GOVERNMENT PRINTING OFFICE: 1930

For sale by the Superintendent of Documents, Washington, D. C. - - - - - Price 5 cents

Cop. 3

LIBRARY
RECEIVED
FEB 25 193
U. S. Department of Agriculture

U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1341
Sl. rev.
Feb. 1932

Rev.ed.
follows

MULE PRODUCTION

XUM

THE ABILITY of the mule to endure hardship and perform sterling service under adverse conditions has established him as a real asset in American agriculture.

The mule will give best service under favorable conditions of feeding and management.

Good, sound mares should be selected for breeding in order to be successful in producing high-grade mules. A very desirable "mule mare" is one having about one-fourth draft blood.

The most practical feeds to use for mules are those which are grown on the farm or plantation so far as they provide the essential nutrients for a balanced ration.

The general form and appearance of the mule should resemble closely that of a horse, and in judging mules the same general points of perfection should be looked for.

Mules vary in height from 12 hands to 17½ hands and in weight from 600 pounds to 1,600 pounds.

While the mule is essentially a draft animal, it is used widely for utility purposes, especially in the South. A smart, alert mule, with a long, free stride at the walk and a snappy, balanced trot is highly desired.

Washington, D. C.

Issued August, 1923
Revised May, 1927, and March, 1929
Slightly revised February, 1932

MULE PRODUCTION.[1]

By J. O. WILLIAMS, *Senior Animal Husbandman, Animal Husbandry Division, Bureau of Animal Industry.*

CONTENTS.

	Page.		Page.
Distribution of mules in the United States	1	Production of mules—Continued.	
Advantages of the mule as a work animal	2	Weaning the colt	11
Some peculiarities of the mule	2	Care of the colt after weaning	11
Production of mules	4	The orphan foal	12
Selecting the jack	4	Spring or fall colts	13
Care of the jack	5	Educating the colt	13
Feeds for the jack	6	Feeding and care of mules	13
The brood mare	6	Judging mules	14
Breeding the mare	8	Market classes of mules	17
Care of the pregnant mare	9	Draft mules	19
Care of mare at foaling time	10	Farm mules	19
Care of mare and foal	10	Sugar mules	27
		Cotton mules	27
		Mining mules	27

DISTRIBUTION OF MULES IN THE UNITED STATES.

THE importance and popularity of the mule as a work animal are attested by its extensive use in farm operations. In 1910, the number of mules on farms and ranches in this country was 4,209,769. The number on January 1, 1920, increased to 5,432,391, and on April 1, 1930, the total was 5,375,017. Of the 5,375,017 mules on farms in 1930, 3,456,235, or approximately 65 per cent, were in the nine Cotton Belt States, which in number of mules rank as follows:

Texas	1,040,106
Mississippi	369,345
Arkansas	361,508
Georgia	353,633
Alabama	332,133
Oklahoma	315,353
North Carolina	294,308
Louisiana	200,954
South Carolina	188,895
Total	3,456,235

The only States outside the Cotton Belt having more than 150,000 head of mules on farms in 1930 were Tennessee, with 318,567; Missouri, with 295,778; Kentucky, with 252,250; and Kansas, with 151,470. The total number of horses on farms in the Cotton Belt States on April 1, 1930, was 1,845,904, or about 53 per cent as many as mules. The only Cotton Belt State having more horses than mules in 1930 was Oklahoma.

[1] In the preparation of this bulletin the writer is indebted for helpful suggestions and assistance to G. A. Bell, horse-breeding expert in the Remount Service, War Department, and R. S. Whitfield, a former employee of the Animal Husbandry Division.

ADVANTAGES OF THE MULE AS A WORK ANIMAL.

The mule is a hardy work animal. While this humble creature responds to good treatment and gives best service under favorable conditions of feeding and management, it is his ability to endure hardship and to perform sterling service under adverse conditions that has established him so firmly in American agriculture. Those who are stanch supporters of the mule say that, in comparison with the horse, he will live longer, endure more work and hardship, require less attention and feed, is less liable to digestive disorders, lameness, and disease, is more easily handled in large numbers, is less irritable, and is more capable of performing work in the hands of a mediocre or poor horseman. Whether or not all these claims may be

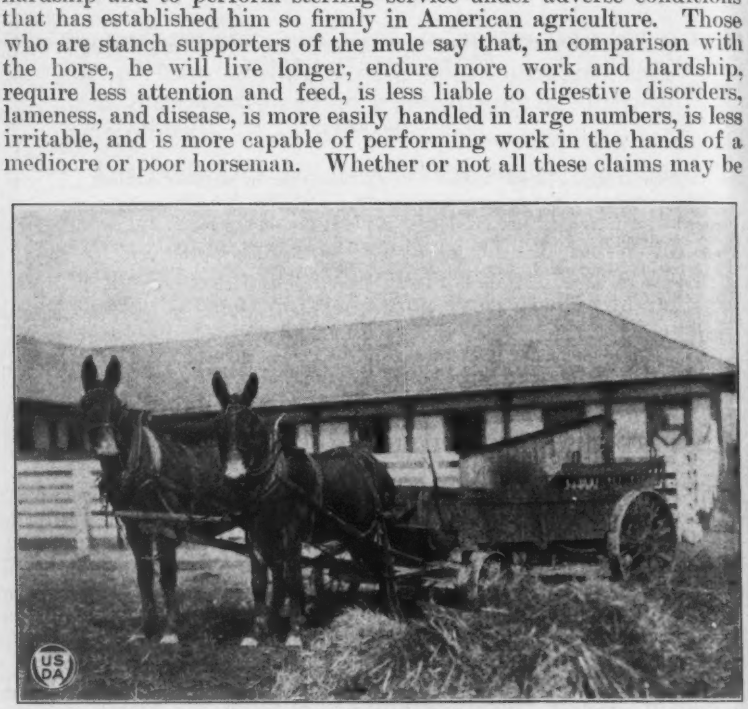


FIG. 1.—A pair of farm mules.

substantiated, it is a fact that the mule is well established as a work animal in those sections where climatic conditions are most severe, feed less abundant, and horsemanship is not a prevailing art (Fig. 1).

SOME PECULIARITIES OF THE MULE.

The mule is an animal with possibly more eccentricities and undeniable virtues than any other domestic animal. One would naturally expect from his heritage a rather unusual temperament requiring the most thoughtful treatment. The difficulty is to know how to handle the mule in order to keep the desirable qualities of his maternal ancestry in the foreground and to keep subservient the latent donkey characteristics. To treat consistently a conglomeration of stubbornness and willingness, temper and sullenness, contentment and restlessness, slyness and docility, faithfulness and waywardness, with no knowledge of which virtue or vice is going to assert itself next, is

a problem which may well tax the qualities of the best horseman. Yet the virtues of the mule have been so evident in times of peace and war that many ardent horse lovers who have been prejudiced against him have come to admire the animal which has no "pride of ancestry or hope of posterity" (Fig. 2).

There are some peculiarities which belong to the mule alone. He does not like to be hurried, worried, or cuffed about; to try to force him to do things against his will is practically impossible and only makes matters worse. The mule must be understood and gently but firmly persuaded to do things out of the ordinary. He is naturally suspicious of everybody who comes around him, and it can be readily observed that he never takes his eye off a person near by, and when the ears begin to wag a little the person watched had better

FIG. 2.—Many mules find their way into the U. S. Army. Good, sound mules with quality are required. This illustration shows representative types of "lead" and "wheel" mules in Army service.

be on the lookout. There seems to be a code system of ear signaling among mules that they all understand. A mean mule can deftly handle his hind legs, and his forelegs are not to be ignored. He has been known to handle his "mits" in a clever fashion. The mule seems to have an uncanny way of detecting whether a person is going to treat him harshly or kindly, and his reception is usually in like manner, nor does he forget the person who inflicts harsh treatment.

There is a wrong and a right way to lead a mule. A man who looks at a mule and lugs at his head will never make any progress. The mule will not be pulled. He will usually follow quietly, however, if a man will walk away in the direction he desires to go. Neither can you "bully" mules into going through tight places; they are somewhat like sheep, and if the leader can be induced to go the rest will follow.

Next to satisfying a hearty appetite the height of mule joy is to roll. A mule will roll at every opportunity and often at inopportune times, when he makes the opportunity suit his own convenience. He dislikes mud and water holes in the road, and is what is known as a sure-footed animal.

PRODUCTION OF MULES.

The mule is a hybrid animal having a jackass, commonly called a jack, for a sire and a mare for a dam. When the reverse cross is made and the female ass (or jennet) is bred to a stallion, the off-

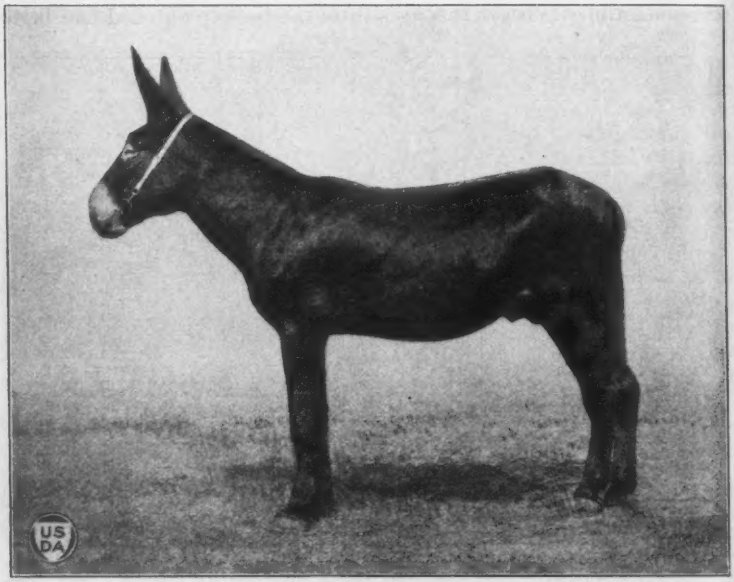


FIG. 3.—A prize-winning jack. Note size of bone and general quality throughout.

spring is called a "hinny." As the mule will not reproduce, it is necessary to maintain both jacks and mares in order to produce mules.

SELECTING THE JACK.

The importation of jacks, and consequently the production of mules, dates back to colonial times. About 1787 George Washington was presented with a jack by the King of Spain, which was used in the stud at Mount Vernon. Many good mules were produced in those days, and the value of the mule as a work animal was soon recognized by intelligent planters. It has been within the last 40 years, however, that the production of mules has been an extensive enterprise and that much attention has been given to the rearing and selection of the best jack stock.

The American jack of to-day is a composite of the bloods of some of the best foreign breeds, and in attaining the highest standard of excellence prevailing in the jack stock of America the breeders have emphasized the valuable utility points so much desired in the best jacks, such as size, weight, bone, style, quality, and action. In America jacks are usually spoken of as jennet jacks and mule jacks. As these terms imply, jennet jacks are used for mating with jennets for the reproduction of the breed, and mule jacks are used for mating with mares for the production of mules.

A good mule jack (Fig. 3) should be not less than 15 hands high and possess plenty of weight, large bone with quality, style, and action. The essential points of conformation in a good jack are a straight, strong back, closely coupled and well muscled over the loin; long and level rump; deep body and spring of rib to allow ample room for lung development. Vigor and strength of constitution are indicated by a broad chest and large heart girth.

The legs should be set straight, be well muscled, and have plenty of bone. The length of leg should be in proportion to depth of body, as height obtained by length of leg is undesirable. The size of the bone is very important and should be ample. The size of the bone is usually determined by measuring the cannon bone about half-way between the knee and the fetlock joint. This circumference should be 8½ inches in a jack of 15 hands' height. It is very desirable to have large, well-shaped feet. The head should be well proportioned, with the profile of the nose straight or slightly roman. The ears should be long, well set, and alert on a mature animal and should measure, horizontally, 33 inches or more in length from tip to tip.

Measurements of a good jack.[1]

[Weight, 1,200 pounds; height (standard measure), 15 hands, 3 inches.]

	Inches.		Inches.
Ears from tip to tip	34	Around body at girth	70
Around face and jaw	39	Around body at loin	67
Around neck at throatlatch	36	Around hoof, below coronet (next to hair)	16½
Around arm	21	Above hock	17½
Around cannon	8½	Below hock	9½
Length from poll to tail	84		

Some of the common defects in jacks which should be avoided are: Flat, narrow chest, which indicates a weak constitution and lack of vigor; light-muscled loin and long coupling; short, drooping rump; excessive length of leg; small feet with contracted heels; and short or droopy ears.

CARE OF THE JACK.

The proper care and management of the jack are somewhat exacting, as he is rather peculiar in his likes and dislikes. While a stallion may be spoiled because of his nervous temperament, the jack may be just as quickly spoiled because of his inclination to be sluggish. The jack should have a caretaker who understands jack man-

[1] Twice champion at the Missouri State Fair and reserve champion at the World's Fair, San Francisco.

XUM

agement thoroughly. This is very important, as the disposition of the jack is partly controlled by the groom. The jack should be quietly but firmly handled, as a bad disposition in a jack is usually attributable to harsh handling or mismanagement of the animal when young. Through continuous observation the groom should learn the peculiar individuality of the jack and the little things required for his proper management.

Abundant exercise is one of the big factors in the management of a breeding animal. A roomy, well-ventilated, and well-lighted box stall opening to an exercising paddock is necessary for the proper care of the jack. It is important that the exercising paddock be of good size. In order to insure plenty of exercise, however, it is well to give the jack some road work.

A young jack intended for siring mules should not be permitted to run with jennets or mules, as this practice usually leads to difficulty in teaching him to serve mares, when used in the stud. Instead the young jack should have fillies or gentle mares for companions. The jack may begin serving mares at the age of 2 or 2½ years, but he should not serve more than one mare a day during his first season nor more than 30 for the entire season. A mature jack may serve as many as two mares in a single day provided the two services are several hours apart. The number of mares a jack should serve during a season depends on the strength and vigor of the individual, but 70 or 80 mares probably is the maximum number that he can serve with satisfactory results. Artificial breeding may be employed if the jack is patronized very heavily. This not only conserves the vitality of the jack but also enables the owner to breed a much larger number of mares. If care and precaution are taken, artificial breeding may be practiced with as much success as breeding in the natural way. In fact, some mares which do not conceive from natural service are successfully impregnated artificially. It is sometimes advisable to use a stallion for teasing purposes in order to conserve the jack when the patronage is heavy.

FEEDS FOR THE JACK.

The jack is a rather sluggish animal, and for this reason his feeds should be slightly laxative in character. Bran, oats, crushed barley, and oil meal are splendid grain feeds to use. Sheaf oats and green feeds are also very satisfactory. Corn should be used only in limited amounts. Many jack breeders obtain good results by feeding sheaf oats, clover, and alfalfa hay.

THE BROOD MARE.

Sound brood mares of good quality should be selected in order to be successful in producing high-grade mules. Considerable effort is usually expended by the breeders of work horses in selecting good mares for breeding purposes, but no consistent effort is usually made by the mule breeder in exercising the same care in selecting brood mares for the production of mules. The idea seems to prevail that

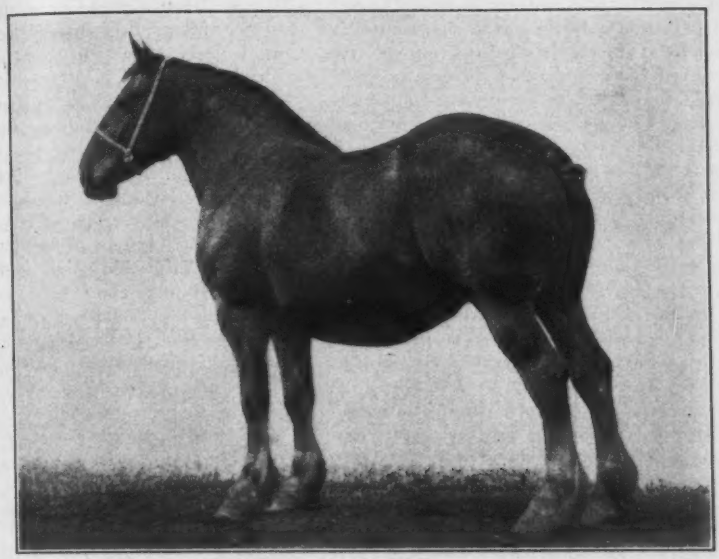


FIG. 4.—A desirable type of brood mare for producing draft mules. Note the "breediness," substance, and conformation of this mare.

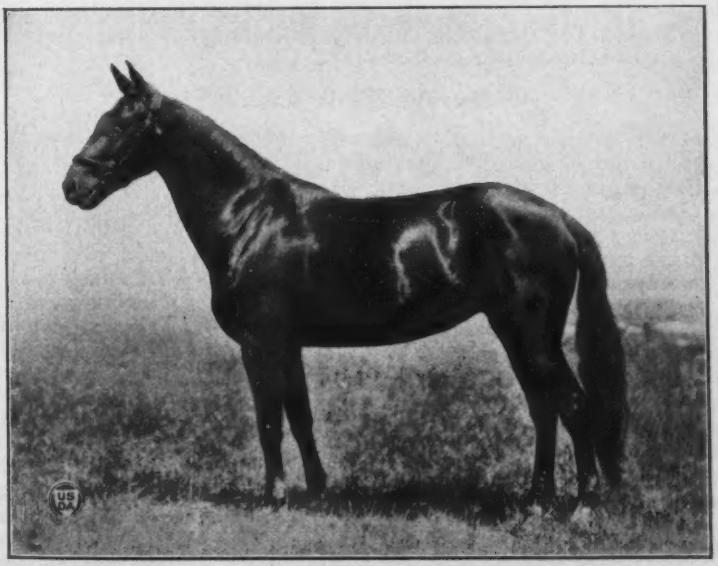


FIG. 5.—A desirable type of light "mule mare" for producing mules of quality. Note roominess of body, short back, depth of heart girth, and "breediness" of this mare.

154785°—33——2

a mare which is not suitable for breeding to a stallion is good enough to produce a mule. This is a mistake, for no matter how good the jack may be, it is inconsistent to expect uniformly good mule colts from inferior mares. The same care should be applied in selecting mule mares as is exercised in selecting brood mares to raise horse colts. The mares used in mule production are of no fixed type or breed and vary from the large, heavy mares of the draft breeds to the smaller mares of the light-horse breeds (Figs. 4 and 5). As the mule is a work animal which can not reproduce its kind, it is not essential that mares for producing them be of any fixed breeding. Mules from the larger mares of the draft breeds are large and heavy and are excellent for draft purposes, but they are more sluggish and can not stand heat so well as mules produced from mares having light-horse blood in their veins. Experienced breeders state that a very desirable mule mare is one having about one-fourth draft blood. A mare of this breeding will produce good-sized mules, with style, action, and stamina. It seems that type rather than breeding is the prime requisite of a good mule mare.

In conformation the mule mare should possess all the good qualities desired in the brood mare used for producing good work horses. Some of the most important points of the good mule mare are:

A broad chest and large heart girth, indicating a vigorous constitution; a roomy barrel to allow for full development of the fetus; a straight back, strongly muscled over the loins; well-set legs with broad, flat bone, sound and of good quality; large and well-shaped feet; and feminine character, indicating "breediness." To sum up, the mare should combine size with quality, type, soundness, and breediness. The last term includes a variety of characteristics which makes the mare a good mother.

BREEDING THE MARE.

The mare will come in heat, on an average, every 18 to 21 days and will remain in heat from 2 to 4 days, though exceptional mares vary in this respect and remain in heat only a few hours. The mare usually comes in heat on the ninth day after the foal is dropped. In order to avoid accidents at breeding time, hobbles should always be put on the mare. Conception is more likely to take place if the mare is rested for a few hours at time of service. The mare should be returned to the jack in from 18 to 21 days after service, in order to make sure that conception has taken place.

TABLE 1.—*Calendar showing time of service and date of foaling based on 340-day gestation period for mares.*

Day of month mare is bred.	Date of foaling.											
	Bred in Jan.	Bred in Feb.	Bred in Mar.	Bred in Apr.	Bred in May.	Bred in June.	Bred in July.	Bred in Aug.	Bred in Sept.	Bred in Oct.	Bred in Nov.	Bred in Dec.
	Dec.	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May.*	*June.*	*July.*	*Aug.*	*Sept.*	*Oct.*	*Nov.*
1	6	6	3	6	5	6	5	6	6	5	6	5
2	7	7	4	7	6	7	6	7	7	6	7	6
3	8	8	5	8	7	8	7	8	8	7	8	7
4	9	9	6	9	8	9	8	9	9	8	9	8
5	10	10	7	10	9	10	9	10	10	9	10	9
6	11	11	8	11	10	11	10	11	11	10	11	10
7	12	12	9	12	11	12	11	12	12	11	12	11
8	13	13	10	13	12	13	12	13	13	12	13	12
9	14	14	11	14	13	14	13	14	14	13	14	13
10	15	15	12	15	14	15	14	15	15	14	15	14
11	16	16	13	16	15	16	15	16	16	15	16	15
12	17	17	14	17	16	17	16	17	17	16	17	16
13	18	18	15	18	17	18	17	18	18	17	18	17
14	19	19	16	19	18	19	18	19	19	18	19	18
15	20	20	17	20	19	20	19	20	20	19	20	19
16	21	21	18	21	20	21	20	21	21	20	21	20
17	22	22	19	22	21	22	21	22	22	21	22	21
18	23	23	20	23	22	23	22	23	23	22	23	22
19	24	24	21	24	23	24	23	24	24	23	24	23
20	25	25	22	25	24	25	24	25	25	24	25	24
21	26	26	23	26	25	26	25	26	26	25	26	25
22	27	27	24	27	26	27	26	27	27	26	27	26
23	28	28	25	28	27	28	27	28	28	27	28	27
24	29	29	26	29	28	29	28	29	29	28	29	28
25	30	30	27	30	29	30	29	30	30	29	30	29
26	31	31	28	31	30	31	30	31	31	30	31	30
	Jan.	*Feb.*	*Mar.*	*Apr.*	*May.*	*June.*	*July.*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
27	1	1	1	1	1	1	1	1	1	1	1	1
28	2	2	2	2	2	2	2	2	2	2	2	2
29	3	.....	3	3	3	3	3	3	3	3	3	3
30	4	.....	4	4	4	4	4	4	4	4	4	4
31	5	.....	5	.....	5	.....	5	5	.....	5	.....	5

CARE OF THE PREGNANT MARE.

There should be no sudden changes in feed or work of the mare after she becomes pregnant. She should be given a well-balanced ration of feed that will supply the needs of her own body as well as those of the growing fetus. Feeds that are too fattening should be avoided, also moldy or damaged hay, as there is a suspicion that either may cause abortion. Exercise is a most important essential to the health of the pregnant mare, as well as for the development of a strong, healthy foal. The best and most economical way of giving this exercise is by using the mare in regular farm work. The pregnant brood mare should not be subjected to hard pulls or severe strains. By using care and judgment the mare may be safely worked up to within a week or ten days of foaling. The average gestation period of mares—that is, the length of time that they carry their foals—is about 340 days. This period varies slightly with individual mares. It is important that a careful record be kept of the date of service to the jack in order that the time of foaling may be anticipated. A very sure sign that the foal will be dropped in a short while is the appearance of wax on the teats, which usually appears two or three days before parturition.

XUM

CARE OF MARE AT FOALING TIME.

About a week or ten days before the foal is expected the mare should be turned into a pasture or paddock, where there is no danger of injury from other animals. If the weather is mild, a paddock or pasture is a desirable place for the foal to be delivered. There is probably less danger of infection in a pasture than in a stable. If desirable conditions for foaling outside can not be provided for, a roomy box stall that has been well cleaned out, disinfected, and bedded with fresh straw should be provided.

It is well to observe the mare closely when the foal is expected, in order that assistance may be given in delivery if necessary. It will be necessary for the attendant to be where he can see the mare and yet be unseen by her. Should she need assistance, a veterinarian should be summoned at once. If it is essential that aid be given, the service should be rendered by one who has had experience with and understands the many phases of difficult parturition.

If the foal has been delivered satisfactorily, the attendant should remove as soon as possible any tissue or matter that may be clogging its nostrils and see that respiration is started. Assistance may be rendered in this respect by blowing into the foal's nostrils and rubbing its sides with a cloth or wisp of straw. As soon as practicable, without disturbing the mare unnecessarily, remove the afterbirth from the proximity of the mare and, if foaling occurred in a stable, clean out the bedding that has been soiled during parturition, sprinkle lime on the floor where the bedding has been removed. and supply fresh bedding.

To prevent infection, the navel cord of the foal should be saturated with full-strength tincture of iodin or a solution of 1 to 1,000 corrosive sublimate, and then dusted with powdered slaked lime. This should be repeated each day until the navel cord drops off. A normal foal will usually find its own way to the mare's udder soon after arrival. If, however, the foal is weak and unable to stand within two or three hours after birth, it should be assisted in getting its first meal. It is very important that the newborn foal get the first milk from its dam, which is a substance called colostrum. In addition to having the food properties so much needed by the new born, the colostrum also has a purgative effect, which stimulates the action of the digestive tract in eliminating the fecal matter already collected during the period of gestation. If this fecal matter is not eliminated within 24 hours after the colt is born, a dose of castor oil (2 to 4 tablespoons) shaken well in milk should be given and repeated in three or four hours until the desired results are obtained.

CARE OF MARE AND FOAL.

The mare should receive bran mashes and light feeds until she has recovered from the effects of foaling and the feverish condition of her system has disappeared. The ration should then be increased gradually until the mare is on full feed.

When the weather is warm and pleasant, the mare and foal may be turned out on pasture or paddock as soon as the foal is able to follow, as exercise is very beneficial and they will thrive better in the open.

If the mare was being worked prior to foaling, she will be ready for work again in 10 days or two weeks after the colt is born. When this is done the colt should be confined in a stable or paddock and not permitted to follow in the fields. The mare and colt will fret for each other for a while, but they will soon become accustomed to separation. When working, the mare should be returned to the stable once in the forenoon and in the midafternoon to allow the colt to suckle. The mare should be allowed to cool before being turned in with the colt, as there is danger of causing the colt to have scours and other digestive troubles if the mare is overheated when nursing.

When the mare is idle during the fly season, it is best to keep her and her foal in a darkened stable in the day and turn them out on pasture at night. The mare should be fed some grain and hay, as grass alone will not supply the needs of her body and also provide a sufficient milk flow for the colt.

The colt usually begins to eat a small amount of grain at the age of three or four weeks. Oatmeal should be the first grain fed and bran may be added later. Best results in feeding grain to colts in the open are obtained by building a creep under which they may pass at all times and which will prevent the mares or other mature horses from reaching the feed provided for the colts. The colt will eat only a little grain at first, but it is worth much to have it begin eating a small amount as soon as possible, because the more accustomed it becomes to eating grain while young the less trouble there will be at weaning time. The mare may be induced to frequent the creep by giving her an occasional feed near there also.

WEANING THE COLT.

Under ordinary conditions the colt is usually weaned when about six months old, but if the mare is working and the colt is thrifty it may be weaned earlier. When the colt has been taught to eat grain early, this separation from its dam need not cause any check in the colt's development. This is a trying time in the life of a colt, however, and it should receive additional feed and care to make up for the loss of the mother's milk from its ration. When the colt is once taken away from the mare, the separation should be made complete.

The mare requires some individual attention at weaning time. It will be necessary to milk her by hand for a few days to prevent too much milk from collecting in the udder and causing it to become caked and swollen. To assist in the drying-up process, the mare should be milked only partially dry and if the milk flow is maintained the grain ration should be reduced for a few days.

CARE OF THE COLT AFTER WEANING.

At no time in the colt's life is pasture more important than at the time of weaning. On being taken away from its dam, the colt needs succulent feed and the best way of supplying this feed is by having a good pasture. Not only is a good pasture necessary for the development of the colt, but it is also necessary if the colt is to be raised in an economical manner. In addition to the pasture the colt should

XUM

receive liberal amounts of grain and hay. Half of its growth is made during its first year and it should have every advantage possible for its development. Colts like companionship and they do better if several are allowed to run together (Fig. 6).

THE ORPHAN COLT.

It may happen sometimes that the mare dies soon after foaling or fails to give milk enough for her foal. When either of these misfortunes occurs the colt must be raised by hand, which is a tedious undertaking but is worth while if done properly. As a feed for the orphan colt, the best and most practical substitute for mare's milk is cow's milk after it has been prepared to conform as nearly as possible

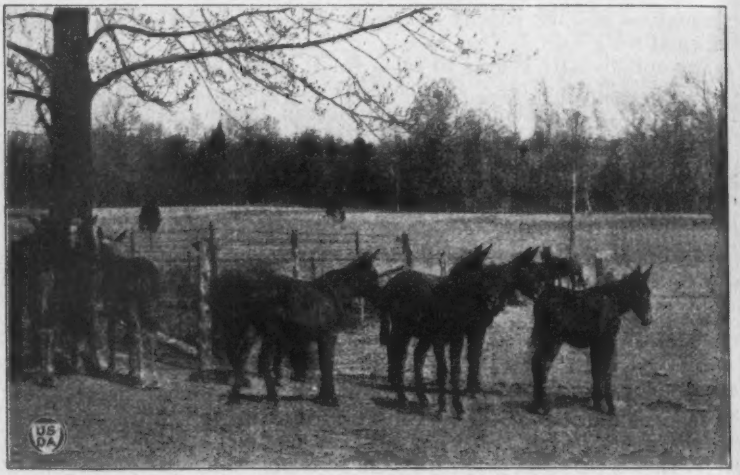


FIG. 6.—Mule foals like companionship. A group of weanlings on pasture.

in composition to the milk of the mare. This is done by selecting milk that is low in butterfat and diluting it with one part of fresh water for three parts of milk. Add a tablespoon of sugar and three or four tablespoons of limewater to a pint of this diluted milk and heat to body temperature. Give the foal about a half teacup of this prepared milk at first and at short intervals gradually increase the amount and the length of time between feeding periods as the foal develops. A bottle with a rubber nipple attached is the most convenient way to give milk to the orphan. As the foal suckles frequently in small amounts when following its dam, one should feed it frequently and thus conform as nearly to natural conditions as possible.

The utensils used in feeding the orphan foal should be kept scrupulously clean. This can be done by freely utilizing hot water and sunshine, both of which are enemies to germs that collect and thrive in milk containers.

SPRING OR FALL COLTS.

The climatic conditions and nature of the farm work determine largely whether it is best to have the colts come in the spring or in the fall.

The natural breeding season for mares is in the spring, which is the generally accepted time to have colts. There are, however, several advantages of having fall colts, especially in the South. The fall-born colt comes at a time when the mare can probably be more easily spared from farm work and at a time when flies are not so abundant. Another advantage is that the fall colt is weaned at a time when it can be turned on to pasture and its development is not retarded at this critical time. The spring colt is weaned at a time when the grazing season is practically over.

EDUCATING THE COLT.

The time to begin the education of the colt is early in its life. It should be halterbroken and taught to be led when a few weeks old. The more the colt is handled when young the fewer difficulties will be encountered later when it is desired to put him to work.

Mules reach maturity at the age of 5 years, but they may be given light work when 3 years old. Care should be taken not to overload young mules. Overtaxing the young animal not only tends to check its development but also causes it to become unreliable as a worker, and possibly balky. A young mule that becomes accustomed to moving a load every time it is called upon will develop into a reliable work animal.

FEEDING AND CARE OF MULES.

Too little thought and attention are usually given to the proper methods of management and feeding of mules. Where the use of mules as work stock prevails, the feeding is usually done in a haphazard manner without regard to efficiency and economy. The essentials of a good caretaker are judgment and common sense combined with some knowledge of feeds. The most practical feeds to use are those which are grown on the farm or plantation so far as they provide the essential nutrients for a balanced ration. Corn, oats, and barley are the most widely used grains, as there is hardly a section of the United States where one or more of these grains are not grown. These grains may be combined to make a satisfactory feed or taken singly and supplemented with such feeds as bran, oil meal, or cottonseed meal to make a balanced ration. A balanced ration is one which will supply the protein and carbohydrate elements in such proportion as to meet as nearly as possible the body requirements of the animal for doing the work which it is to perform.[2] The same principles that are used in the correct feeding of horses may also be applied to the feeding of mules. As a general rule 1.1 pounds of grain and 1¼ pounds of hay daily per 100 pounds of live weight will be found to be about the right amount of feed to use for an animal at medium work. The exact

[2] Methods of computing a balanced ration are fully explained in Farmers' Bulletin 1030, Feeding Horses, which may be obtained on request from the Division of Publications, Department of Agriculture, Washington, D. C.

XUM

quantity of feed depends upon the individual animal and must be determined by the feeder.

While there are many cases in which mules are underfed, there are probably many others in which the owner suffers financially because the mules are fed more high-priced feeds than they really need, through the use of improperly balanced rations. Overfeeding is most likely to be done during the winter months, when the mules are idle. During this period idle mules may be kept in good condition largely on hay and straw and a small amount of grain. Mules that are worked hard and are receiving heavy rations should have their feed allowance diminished when idle. Idle mules thrive better if they are not confined in stables but are kept in the open.

Digestive disorders are more prevalent among work stock during the spring and summer months than at any other time. This is due to the improper feeding and watering of overheated animals. If the work animal appears to be excessively warm when brought in from work, it should be permitted to cool off before watering or feeding. Attention to such details will prevent many cases of colic. Mules sometimes suffer in hot weather from heat because they are allowed to eat too much grain or hay. This is most likely to occur when fresh, new hay is being fed. The hay ration should be fed mainly at night so that there will be several hours in which the mule may partly digest and assimilate this bulky feed before going to work.

Mules like to roll after being unharnessed, and they should have a place where they may rest themselves in this way. They will be much more comfortable in summer if they are turned out of their stables at night after they have cleaned up their feed. If they are turned on to pasture at night they will sweat more the next day, but the beneficial effects obtained from the grass and being in the open will more than offset the effects of excessive sweating. If unable to provide pasture for the mules at night during the summer, a paddock or lot should be provided where they may be comfortable.

JUDGING MULES.

The general form and appearance of the mule should resemble closely that of a horse, and in judging mules the same general points of perfection are looked for. The nearer the mule approaches the ideal desired in a draft horse the more valuable he is from a market standpoint. In the mule there are certain characteristics derived from his paternal side which are mainly indicated in his bray, disposition, ears, tail, and feet, aside from which the mule does not differ materially from the dam.

Mules vary in height from the little 12-hand pit mules to the large draft mules standing 17½ hands. The range in height of various classes of mules is given in another portion of this bulletin under "Market classes of mules."

The weight of mules varies from 600 pounds to 1,600 pounds. The average weight of the larger type of mules varies between 1,150 and 1,400 pounds and is the range of weight within which the majority of the most marketable mules are classified.

The form of the mule should be compact, with a deep body, broad chest, full flanks, short back, and well-sprung ribs. Light, waspy flanks, long narrow bodies, and long backs are not desirable.

Quality is rather difficult to define, but is that which every capable judge looks for in any animal. It is indicated in a mule by a trim, fine ear, clean-cut head and joints, flinty flat bone, well-defined tendons, and soft, silky hair. Quality marks the difference between a "market topper" and a "jar head." A short, thick ear, a coarse head, round, spongy bone, and a harsh coat of hair are indications which the judge should discriminate against.

The natural tendency of the mule is to be lazy and obstinate. An active, energetic mule is much desired.

It is in the hind quarters of the mule that the greatest faults of conformation are usually found. The croup is often very short

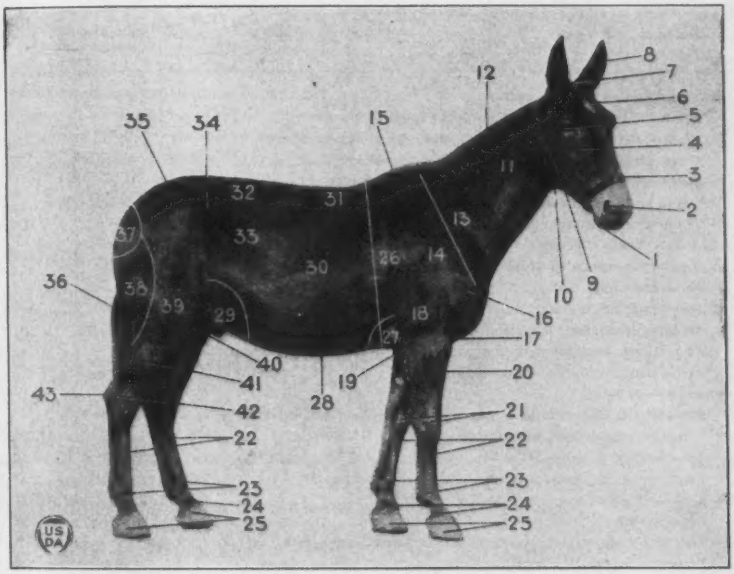


FIG. 7.—The points of the mule: 1, mouth; 2, nostril; 3, nose; 4, face; 5, eye; 6, forehead; 7, poll; 8, ear; 9, lower jaw; 10, throatlatch; 11, neck; 12, crest; 13, shoulder bed; 14, shoulder; 15, withers; 16, point of shoulder; 17, breast; 18, arm; 19, elbow; 20, forearm; 21, knees; 22, cannons; 23, fetlocks; 24, pasterns; 25, feet; 26, heart girth; 27, fore flank; 28, underline; 29, hind flank; 30, barrel; 31, back; 32, loin; 33, coupling; 34, hip; 35, croup; 36, tail; 37, buttock; 38, quarters; 39, thigh; 40, stifle; 41, gaskin; 42, hock; 43, point of hock.

and steep, the hips sloping, the thighs narrow, and the hind legs sickle shaped. These are faults of conformation that judges should discriminate against sharply. It is in the hind quarters and loins that the draft animal obtains propelling power. These portions of the animal, therefore, should be correctly built and properly developed. The loins should be broad, short, and thickly muscled; the croup long and level; the hips long, level, and muscular; the thighs thick,

XUM

long, and well muscled; and the hind legs well set, with broad, clean-cut hocks and flat, dense bone. The mule should stand on good feet that are well shaped.

While the mule is essentially a draft animal, it is used widely for general utility purposes, especially in the South. Though style and action may not be so important qualities in a mule as they are in the lighter breeds of horses, these qualities add materially to its value. A smart, alert mule, with a long, free stride at the walk and a snappy, balanced trot is highly desired. Figure 7 and the accompanying score card give points in the study of conformation.

Score Card for the Mule.

Scale of points.	Standard score.	Points given animal judged.	
		Student's score.	Corrected score.
GENERAL APPEARANCE—16 points:			
Height—Estimated hands....; actual hands.....			
Weight—Estimated....; actual....; according to age and type....	4		
Form—Broad, deep, compact, smooth, symmetrical	4		
Quality—Clean, dense bone with sufficient substance; refined head and ears; fine hair; defined joints and tendons	4		
Temperament—Active; good disposition	4		
HEAD AND NECK—7 points:			
Head—Proportionate; clear-cut features	1		
Forehead—Broad, full	1		
Eyes—Full, bright, clear	1		
Muzzle—Broad, fine; large nostrils; trim and even lips	1		
Ears—Large, long, pointed, fine, well set, carried alert	1		
Neck—Long, muscular, clean-cut throatlatch	2		
FOREHAND—24 points:			
Shoulders—Long, sloping, smooth, muscular, blending into smooth, well-defined withers	3		
Arms—Short, muscular, elbow in	1		
Forearms—Long, wide, muscular	2		
Knees—Straight, wide, deep, well supported	2		
Cannons—Short, wide, flat, well-defined tendons	2		
Fetlocks—Wide, straight, tendons well back, well supported	1		
Pasterns—Of medium length, oblique (about 45°), clean, strong	3		
Feet—Of medium size, set straight; dense, smooth horn; slope of wall parallel to pastern; wide, high heels; concave sole; strong bars; prominent, elastic frog	6		
Leg position—In front, a perpendicular line from point of shoulder should divide the leg and foot into lateral halves; from the side, a similar line from the bony prominence on shoulder blade should pass through the center of elbow, knee, and pastern joints, and meet the ground back of foot	4		
BODY—9 points:			
Chest—Deep, wide	2		
Ribs—Long, well sprung, close	2		
Back—Short, broad, strong	2		
Loin—Short, wide, muscular	2		
Flanks—Deep, full; long, low underline	1		

Score Card for the Mule—Continued.

Scale of points.	Standard score.	Points given animal judged.	
		Student's score.	Corrected score.
HIND QUARTERS—32 points:			
Hips—Wide, level, smooth, muscular	2		
Croup—Long, level, muscular	2		
Tail—Set high, well carried	1		
Quarters and thighs—Deep and muscular; strongly joined to gaskins	3		
Stifles—Broad, thick, strong	1		
Gaskins—(Lower thighs) long, wide, muscular	2		
Hocks—Straight, wide, prominent points, deep, flat, clean-cut, well supported	6		
Cannons—Similar to front, but a trifle longer and wider	2		
Fetlocks—Wide, straight, tendons well back	2		
Pasterns—Similar to front, but less sloping (about 55°)	3		
Feet—Similar to front, but not quite as large	4		
Leg position—From rear, a perpendicular line from point of buttock should divide the leg and foot into lateral halves; from the side, this same line should touch the point of hock and run parallel to the cannon. A similar line from hip joint should meet the ground midway between heel and toe	4		
ACTION—12 points:			
Walk—Active, straight, balanced, long stride	7		
Trot—Straight, long, free, regular, snappy stride	5		
Total	100		

MARKET CLASSES OF MULES.

Mules are classified according to their use. There are many local market classifications of mules, but they may be grouped into five general classes. Each class includes mules of a general type, while there are various grades and weights within a specific class.

The general classes of mules are shown in the table.

TABLE 2.—*Ranges in height and weight of various classes of mules.*[1]

Class.	Range in height.	Range in weight.
	Hands.	*Pounds.*
Draft	16 to 17½	1,200 to 1,600
Farm	15½ to 16	900 to 1,250
Sugar	16 to 17	1,150 to 1,300
Cotton	13½ to 15½	750 to 1,100
Mining	12 to 16	600 to 1,350

Each of the classes is graded according to conformation, soundness, quality, condition, and action into the following grades: Choice, good, medium, common, inferior.

[1] Market Classes and Grades of Horses and Mules. Bulletin 122, Illinois Agricultural Experiment Station, 2d ed. 1912.

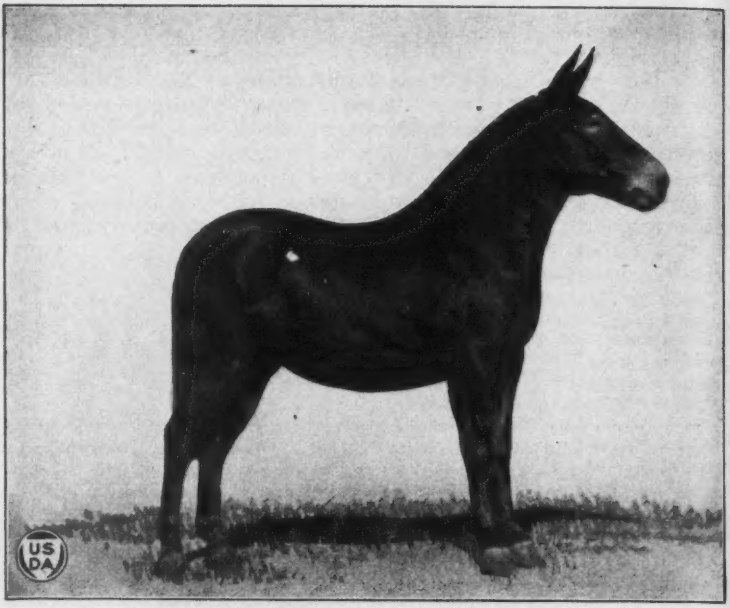


FIG. 8.—A choice draft mule. Champion mule at American Royal Livestock Show, Kansas City, Mo., 1922.

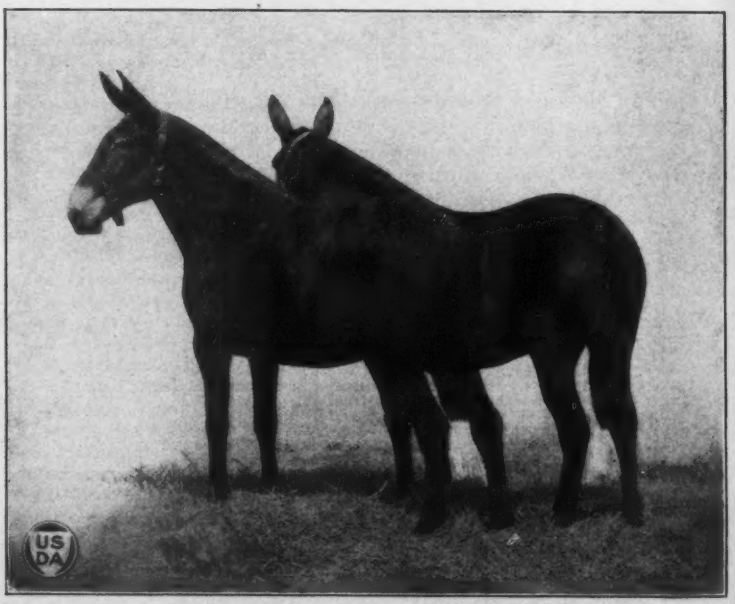


FIG. 9.—A pair of choice draft mules.

DRAFT MULES.

The draft-mule class includes the largest mules (Figs. 8, 9, 10), standing from 16 to 17½ hands and weighing from 1,200 to 1,600 pounds. Some exceptional draft mules exceed the maximum weight given for this class. They are used largely for heavy teaming in large cities, especially in the warmer climates; for contract jobs, such as road grading and railroad work; and for lumber work. Mules for contract work are usually designated by an appropriate descriptive name, such, for instance, as "railroaders." The heaviest draft mules find their way to the lumber camps. Contract mules

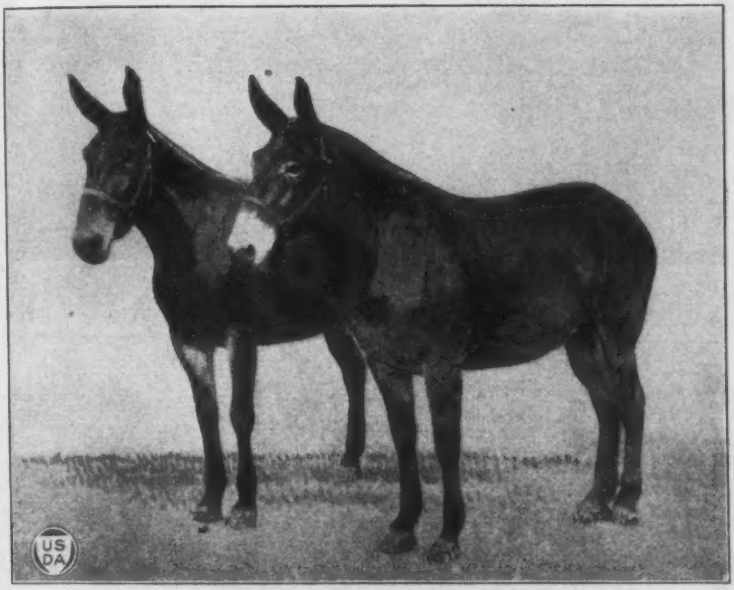


FIG. 10.—A pair of good draft mules.

must have more quality than lumber mules, but extreme weight is not so essential. The greatest demand for draft mules is for those between the ages of 5 and 8 years.

There is no special preference in regard to sex. The highest prices paid are for those mules having weight combined with heavy bone, large, well-shaped feet, strong, short backs, closely coupled with abundant muscling over the loin and hind quarters.

FARM MULES.

Mules purchased in the market for farm work in the Middle Western States are known as "farm mules." There is more variation in quality and type in this class than in any other class, as the demand for a specific type is not so well defined (Figs. 11, 12, 13, 14).

FIG. 11.—A pair of large farm mules.

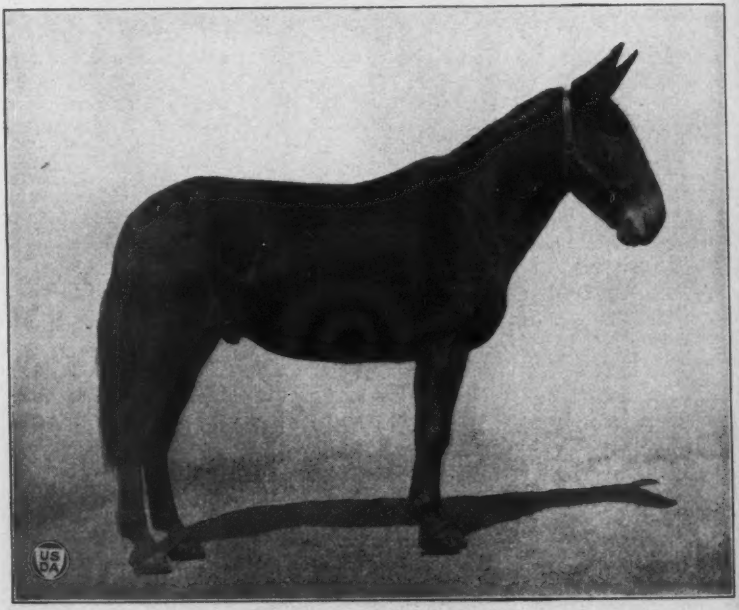


FIG. 12.—A good farm mule.

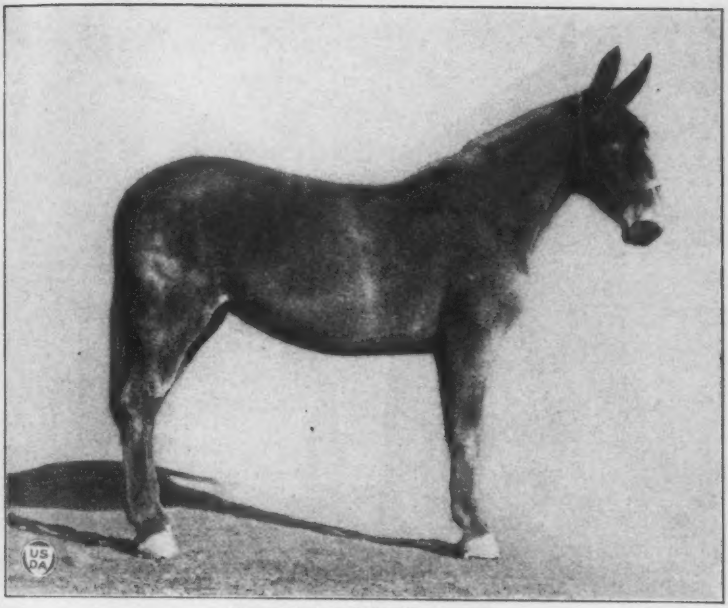


FIG. 13.—A medium farm mule.

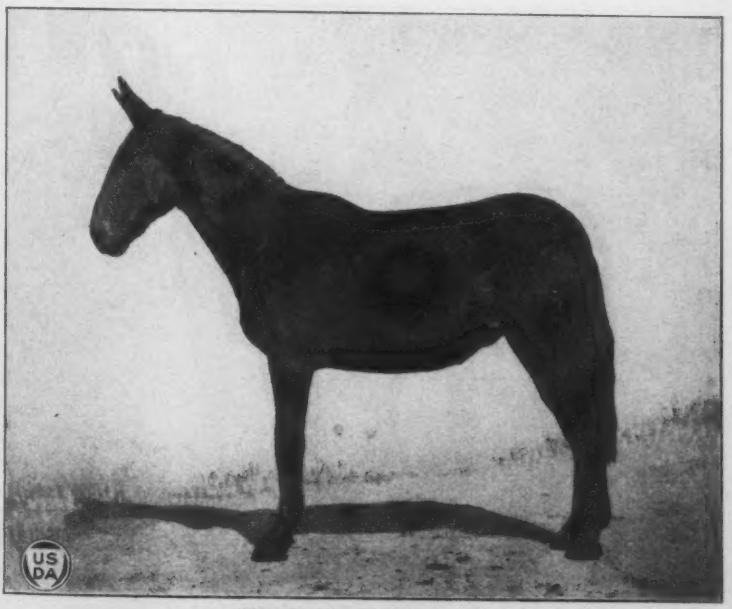


FIG. 14.—Common farm mule.

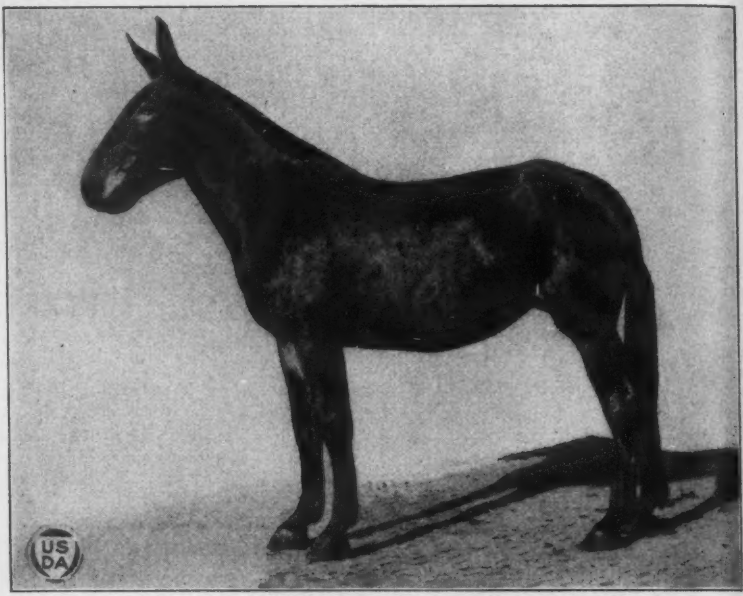


FIG. 15.—A choice sugar mule.

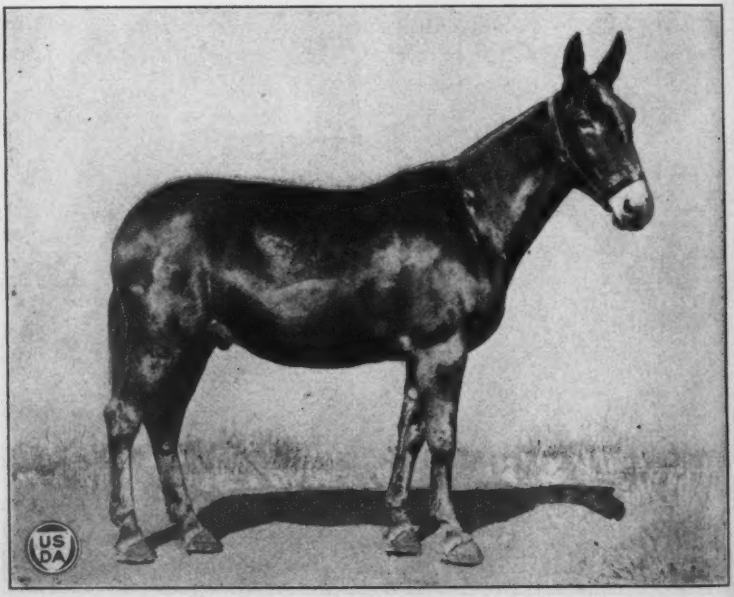


FIG. 16.—A good sugar mule.

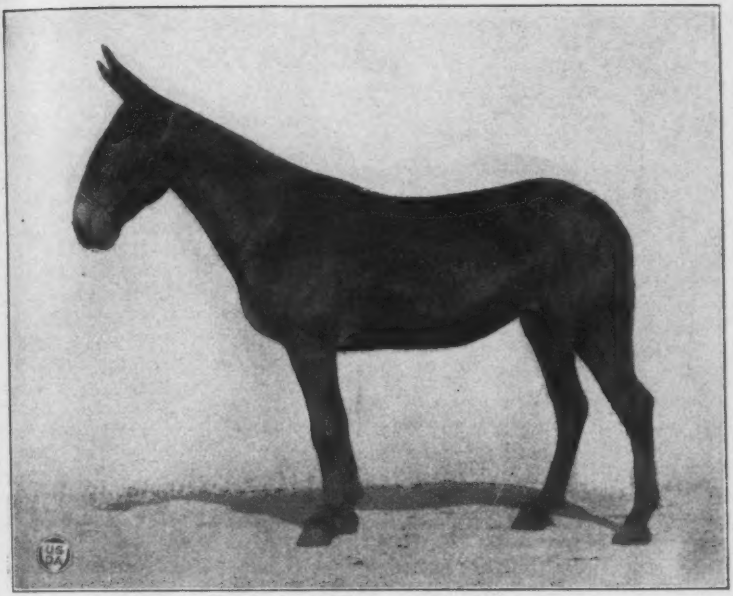


FIG. 17.—Common sugar mule.

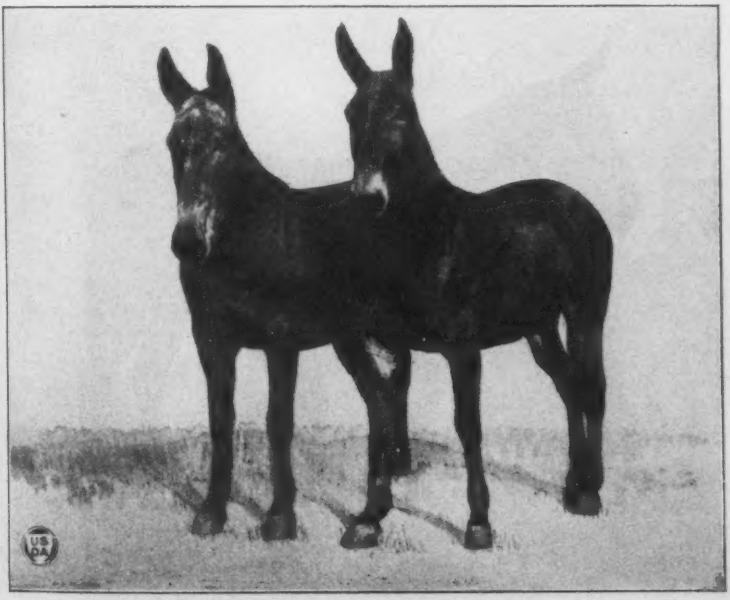


FIG. 18.—A team of choice cotton mules.

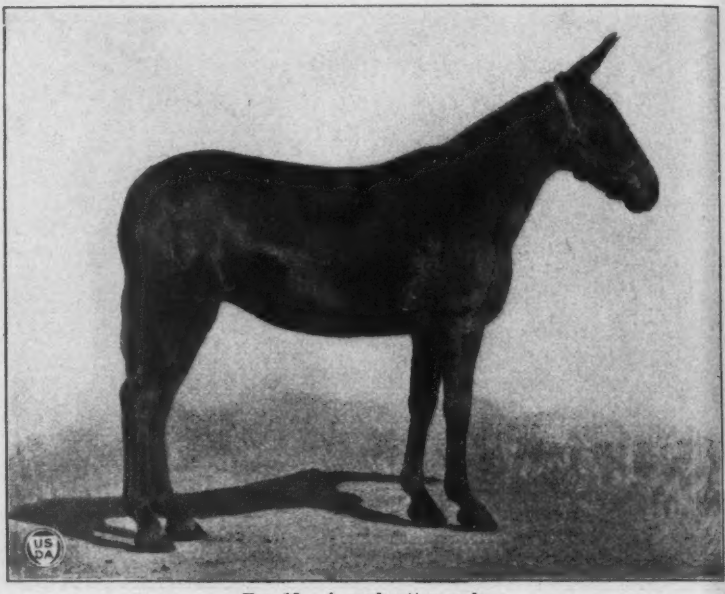


FIG. 19.—A good cotton mule.

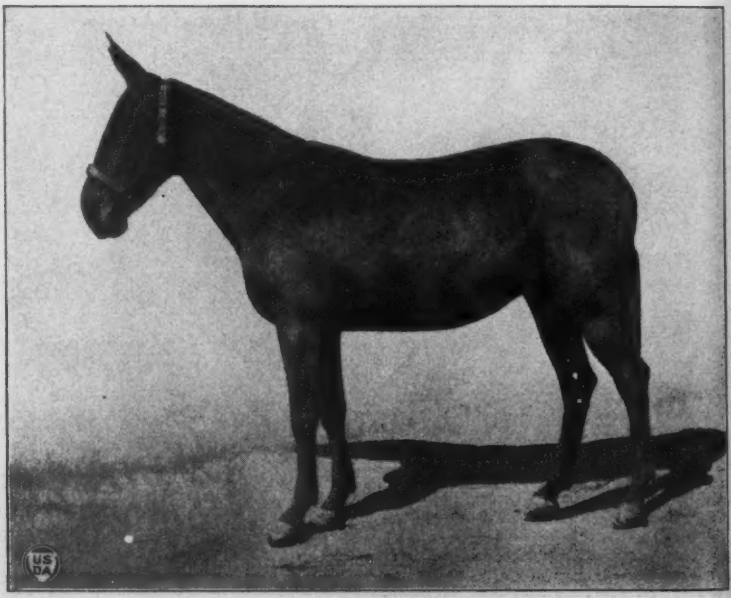


FIG. 20.—A medium cotton mule.

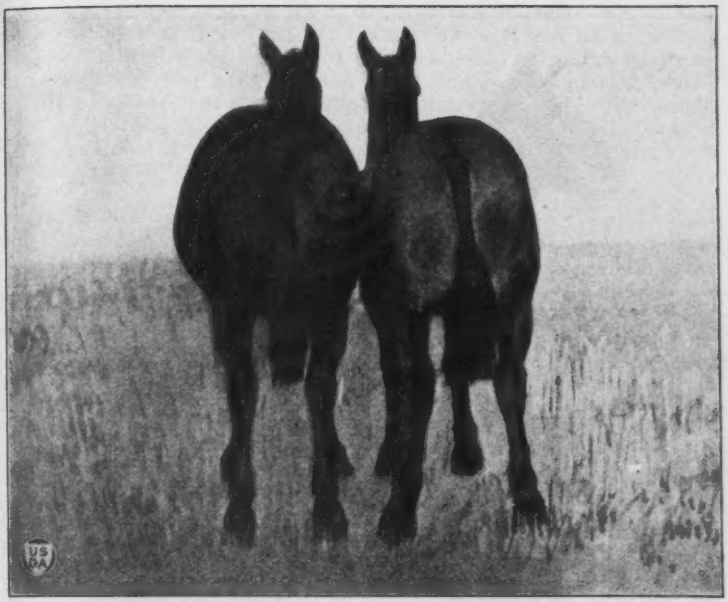


FIG. 21.—A team of choice surface mining mules.

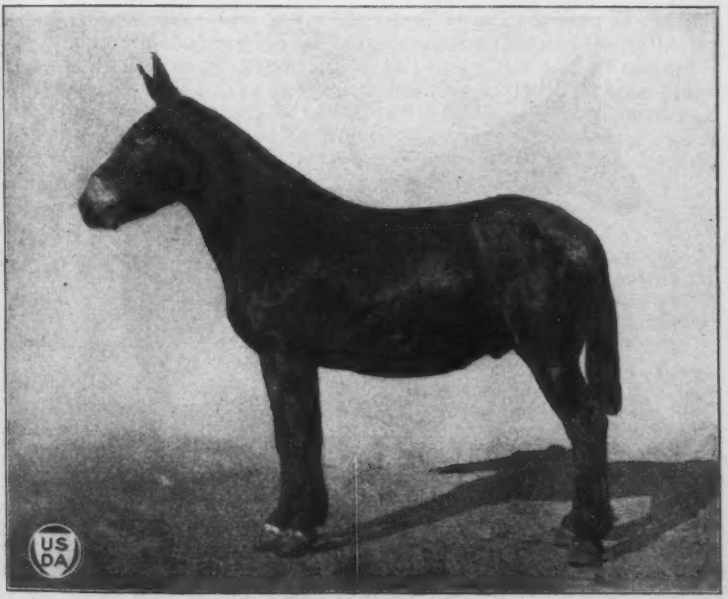


FIG. 22.—A choice surface mining mule.

FIG. 23.—A choice pit mining mule.

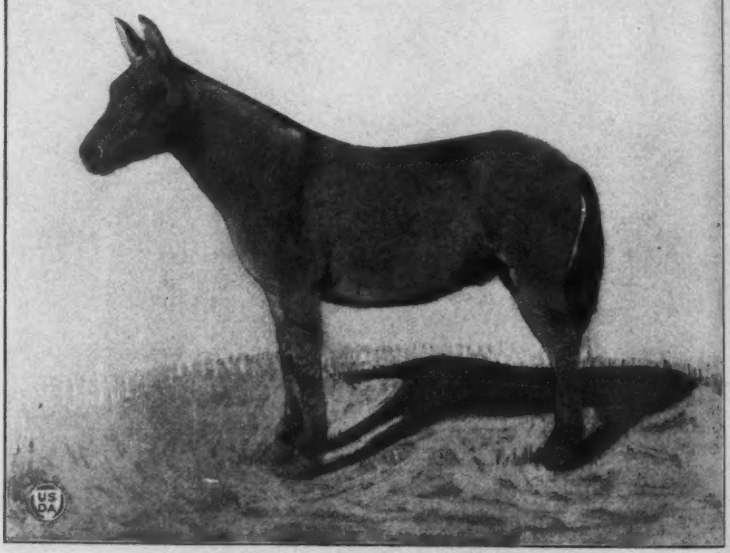


FIG. 24.—A good pit mining mule.

Mules in this class may be plain draft mules or cotton mules that lack finish and condition, as the farmer likes to buy mules with a prospect of developing them into more valuable animals. Many of them are worked for a season and then fitted for the market, where they are placed into one of the other specific classes, such as "drafters," "sugar mules," "cotton mules," "miners," or "railroaders."

SUGAR MULES.

Sugar mules are those which are purchased for shipment to the sugar plantations of the South. This class of mules is somewhat rangy in type and should have quality, style, and finish. The mules in this class are heavier and more compact than cotton mules, but not so heavy as draft mules. The range in weight is from 1,150 to 1,300 pounds. In selecting sugar mules special attention should be given to quality and adaptability to the work. The feet should be large and well shaped. Mare mules are preferred for the sugar trade (Figs. 15, 16, 17).

COTTON MULES.

As the name implies, cotton mules are purchased for cotton plantations. The type (Figs. 18, 19, 20) is somewhat lighter and more angular than the sugar or surface-mining mule and heavier than the pit mule. While there is a gradation of quality and age in this market class, the planters of the South are becoming more and more inclined to increased weight and quality in their mules than prevailed a few years ago. A choice cotton mule weighs about 1,150 pounds and is alert and active, but most mules in this class vary from 750 to 1,100 pounds. The custom in the Cotton Belt is to buy mules in the spring for the crop season and dispose of them in the fall. As they are usually in poor condition following the heavy summer's work, they are sold in the fall for a fraction of the purchase price. These mules are wintered, fattened, and sold back to the planter in the spring. For this reason the age limits within this class are variable. Mules from 5 to 7 years old are preferred, however, for this trade and bring the best prices.

MINING MULES.

There is a wide range in weight among mining mules, varying from 600-pound pit mules to 1,350-pound surface mules (Figs. 21, 22, 23, 24). Good feet and freedom from blemishes are requirements for mules to qualify for top prices for the mining trade.

XUM

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE WHEN THIS PUBLICATION WAS LAST PRINTED

Secretary of Agriculture	ARTHUR M. HYDE.
Assistant Secretary	R. W. DUNLAP.
Director of Scientific Work	A. F. WOODS.
Director of Regulatory Work	WALTER G. CAMPBELL.
Director of Extension Work	C. W. WARBURTON.
Director of Personnel and Business Administration.	W. W. STOCKBERGER.
Director of Information	M. S. EISENHOWER.
Solicitor	E. L. MARSHALL.
Bureau of Agricultural Economics	NILS A. OLSEN, *Chief.*
Bureau of Agricultural Engineering	S. H. MCCRORY, *Chief.*
Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Bureau of Biological Survey	PAUL G. REDINGTON, *Chief.*
Bureau of Chemistry and Soils	H. G. KNIGHT, *Chief.*
Office of Cooperative Extension Work	C. B. SMITH, *Chief.*
Bureau of Dairy Industry	O. E. REED, *Chief.*
Bureau of Entomology	C. L. MARLATT, *Chief.*
Office of Experiment Stations	JAMES T. JARDINE, *Chief.*
Food and Drug Administration	WALTER G. CAMPBELL, *Director of Regulatory Work, in Charge.*
Forest Service	R. Y. STUART, *Chief.*
Grain Futures Administration	J. W. T. DUVEL, *Chief.*
Bureau of Home Economics	LOUISE STANLEY, *Chief.*
Library	CLARIBEL R. BARNETT, *Librarian.*
Bureau of Plant Industry	WILLIAM A. TAYLOR, *Chief.*
Bureau of Plant Quarantine	LEE A. STRONG, *Chief.*
Bureau of Public Roads	THOMAS H. MACDONALD, *Chief.*
Weather Bureau	CHARLES F. MARVIN, *Chief.*

U. S. GOVERNMENT PRINTING OFFICE: 1933

For sale by the Superintendent of Documents, Washington, D. C. - - - - - - Price 5 cents

REVISED

U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1341 Rev. Mar. 1936

Rev.ed. follows

MULE PRODUCTION

XUM

THE ABILITY of the mule to endure hardship and perform sterling service under adverse conditions has established him as a real asset in American agriculture.

The mule will give best service under favorable conditions of feeding and management.

Good, sound mares should be selected for breeding in order to be successful in producing high-grade mules. A very desirable "mule mare" is one having about one-fourth draft blood.

The most practical feeds to use for mules are those which are grown on the farm or plantation so far as they provide the essential nutrients for a balanced ration.

The general form and appearance of the mule should resemble closely that of a horse, and in judging mules the same general points of perfection should be looked for.

Mules vary in height from 12 hands to 17½ hands and in weight from 600 pounds to 1,600 pounds.

While the mule is essentially a draft animal, it is used widely for utility purposes, especially in the South. A smart, alert mule, with a long, free stride at the walk and a snappy, balanced trot is highly desired.

Washington, D. C.

Issued August 1923
Revised March 1929
Slightly revised March 1936

MULE PRODUCTION.

By J. O. WILLIAMS, *Senior Animal Husbandman, Animal Husbandry Division, Bureau of Animal Industry.*

CONTENTS.

	Page.
Distribution of mules in the United States	1
Advantages of the mule as a work animal	2
Some peculiarities of the mule	2
Production of mules	4
Selecting the jack	4
Care of the jack	5
Feeds for the jack	6
The brood mare	6
Breeding the mare	8
Care of the pregnant mare	9
Care of mare at foaling time	10
Care of mare and foal	10
Production of mules—Continued.	
Weaning the colt	11
Care of the colt after weaning	11
The orphan foal	12
Spring or fall colts	13
Educating the colt	13
Feeding and care of mules	13
Judging mules	14
Market classes of mules	17
Draft mules	19
Farm mules	19
Sugar mules	27
Cotton mules	27
Mining mules	27

DISTRIBUTION OF MULES IN THE UNITED STATES.

THE importance and popularity of the mule as a work animal are attested by its extensive use in farm operations. In 1910, the number of mules on farms and ranches in this country was 4,209,769. The number on January 1, 1920, increased to 5,432,391, and on January 1, 1935, the number was 4,795,000. Of the 4,795,000 mules on farms in 1935, 3,168,000, or approximately 66 per cent, were in the nine Cotton Belt States, which in number of mules rank as follows:

Texas	931,000
Mississippi	337,000
Arkansas	300,000
Georgia	333,000
Alabama	319,000
Oklahoma	238,000
North Carolina	271,000
Louisiana	171,000
South Carolina	168,000
Total	3,168,000

The only States outside the Cotton Belt having more than 100,000 head of mules on farms in 1935 were Tennessee, with 306,000; Kentucky, with 256,000; Missouri, with 255,000; Illinois, with 116,000; and Kansas, with 110,000. The total number of horses on farms in the Cotton Belt States on April 1, 1930, was 1,845,904, or about 53 per cent as many as mules. The only Cotton Belt State having more horses than mules in 1930 was Oklahoma.

XUM

ADVANTAGES OF THE MULE AS A WORK ANIMAL.

The mule is a hardy work animal. While this humble creature responds to good treatment and gives best service under favorable conditions of feeding and management, it is his ability to endure hardship and to perform sterling service under adverse conditions that has established him so firmly in American agriculture. Those who are stanch supporters of the mule say that, in comparison with the horse, he will live longer, endure more work and hardship, require less attention and feed, is less liable to digestive disorders, lameness, and disease, is more easily handled in large numbers, is less irritable, and is more capable of performing work in the hands of a mediocre or poor horseman. Whether or not all these claims may be

FIG. 1.—A pair of farm mules.

substantiated, it is a fact that the mule is well established as a work animal in those sections where climatic conditions are most severe, feed less abundant, and horsemanship is not a prevailing art (Fig. 1).

SOME PECULIARITIES OF THE MULE.

The mule is an animal with possibly more eccentricities and undeniable virtues than any other domestic animal. One would naturally expect from his heritage a rather unusual temperament requiring the most thoughtful treatment. The difficulty is to know how to handle the mule in order to keep the desirable qualities of his maternal ancestry in the foreground and to keep subservient the latent donkey characteristics. To treat consistently a conglomeration of stubbornness and willingness, temper and sullenness, contentment and restlessness, slyness and docility, faithfulness and waywardness, with no knowledge of which virtue or vice is going to assert itself next, is

a problem which may well tax the qualities of the best horseman. Yet the virtues of the mule have been so evident in times of peace and war that many ardent horse lovers who have been prejudiced against him have come to admire the animal which has no "pride of ancestry or hope of posterity" (Fig. 2).

There are some peculiarities which belong to the mule alone. He does not like to be hurried, worried, or cuffed about; to try to force him to do things against his will is practically impossible and only makes matters worse. The mule must be understood and gently but firmly persuaded to do things out of the ordinary. He is naturally suspicious of everybody who comes around him, and it can be readily observed that he never takes his eye off a person near by, and when the ears begin to wag a little the person watched had better

FIG. 2.—Many mules find their way into the U. S. Army. Good, sound mules with quality are required. This illustration shows representative types of "lead" and "wheel" mules in Army service.

be on the lookout. There seems to be a code system of ear signaling among mules that they all understand. A mean mule can deftly handle his hind legs, and his forelegs are not to be ignored. He has been known to handle his "mits" in a clever fashion. The mule seems to have an uncanny way of detecting whether a person is going to treat him harshly or kindly, and his reception is usually in like manner, nor does he forget the person who inflicts harsh treatment.

There is a wrong and a right way to lead a mule. A man who looks at a mule and lugs at his head will never make any progress. The mule will not be pulled. He will usually follow quietly, however, if a man will walk away in the direction he desires to go. Neither can you "bully" mules into going through tight places; they are somewhat like sheep, and if the leader can be induced to go the rest will follow.

XUM

Next to satisfying a hearty appetite the height of mule joy is to roll. A mule will roll at every opportunity and often at inopportune times, when he makes the opportunity suit his own convenience. He dislikes mud and water holes in the road. and is what is known as a sure-footed animal.

PRODUCTION OF MULES.

The mule is a hybrid animal having a jackass, commonly called a jack, for a sire and a mare for a dam. When the reverse cross is made and the female ass (or jennet) is bred to a stallion, the off-

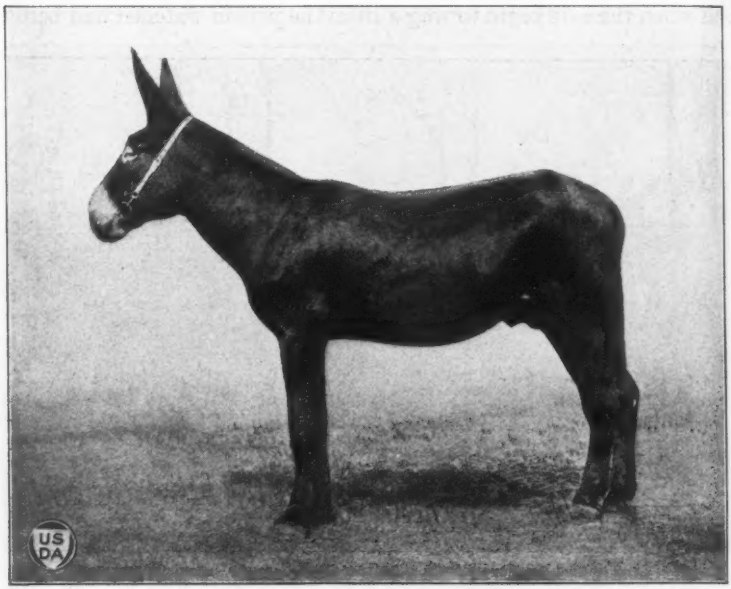


FIG. 3.—A prize-winning jack. Note size of bone and general quality throughout.

spring is called a "hinny." As the mule will not reproduce, it is necessary to maintain both jacks and mares in order to produce mules.

SELECTING THE JACK.

The importation of jacks, and consequently the production of mules, dates back to colonial times. About 1787 George Washington was presented with a jack by the King of Spain, which was used in the stud at Mount Vernon. Many good mules were produced in those days, and the value of the mule as a work animal was soon recognized by intelligent planters. It has been within the last 40 years, however, that the production of mules has been an extensive enterprise and that much attention has been given to the rearing and selection of the best jack stock.

The American jack of to-day is a composite of the bloods of some of the best foreign breeds, and in attaining the highest standard of excellence prevailing in the jack stock of America the breeders have emphasized the valuable utility points so much desired in the best jacks, such as size, weight, bone, style, quality, and action. In America jacks are usually spoken of as jennet jacks and mule jacks. As these terms imply, jennet jacks are used for mating with jennets for the reproduction of the breed, and mule jacks are used for mating with mares for the production of mules.

A good mule jack (Fig. 3) should be not less than 15 hands high and possess plenty of weight, large bone with quality, style, and action. The essential points of conformation in a good jack are a straight, strong back, closely coupled and well muscled over the loin; long and level rump; deep body and spring of rib to allow ample room for lung development. Vigor and strength of constitution are indicated by a broad chest and large heart girth.

The legs should be set straight, be well muscled, and have plenty of bone. The length of leg should be in proportion to depth of body, as height obtained by length of leg is undesirable. The size of the bone is very important and should be ample. The size of the bone is usually determined by measuring the cannon bone about half-way between the knee and the fetlock joint. This circumference should be 8½ inches in a jack of 15 hands' height. It is very desirable to have large, well-shaped feet. The head should be well proportioned, with the profile of the nose straight or slightly roman. The ears should be long, well set, and alert on a mature animal and should measure, horizontally, 33 inches or more in length from tip to tip.

Measurements of a good jack.[1]

[Weight, 1,200 pounds; height (standard measure), 15 hands, 3 inches.]

	Inches.		Inches.
Ears from tip to tip	34	Around body at girth	70
Around face and jaw	39	Around body at loin	67
Around neck at throatlatch	36	Around hoof, below coronet (next to hair)	16½
Around arm	21	Above hock	17½
Around cannon	8½	Below hock	9½
Length from poll to tail	84		

Some of the common defects in jacks which should be avoided are: Flat, narrow chest, which indicates a weak constitution and lack of vigor; light-muscled loin and long coupling; short, drooping rump; excessive length of leg; small feet with contracted heels; and short or droopy ears.

CARE OF THE JACK.

The proper care and management of the jack are somewhat exacting, as he is rather peculiar in his likes and dislikes. While a stallion may be spoiled because of his nervous temperament, the jack may be just as quickly spoiled because of his inclination to be sluggish. The jack should have a caretaker who understands jack man-

[1] Twice champion at the Missouri State Fair and reserve champion at the World's Fair, San Francisco.

agement thoroughly. This is very important, as the disposition of the jack is partly controlled by the groom. The jack should be quietly but firmly handled, as a bad disposition in a jack is usually attributable to harsh handling or mismanagement of the animal when young. Through continuous observation the groom should learn the peculiar individuality of the jack and the little things required for his proper management.

Abundant exercise is one of the big factors in the management of a breeding animal. A roomy, well-ventilated, and well-lighted box stall opening to an exercising paddock is necessary for the proper care of the jack. It is important that the exercising paddock be of good size. In order to insure plenty of exercise, however, it is well to give the jack some road work.

A young jack intended for siring mules should not be permitted to run with jennets or mules, as this practice usually leads to difficulty in teaching him to serve mares, when used in the stud. Instead the young jack should have fillies or gentle mares for companions. The jack may begin serving mares at the age of 2 or 2½ years, but he should not serve more than one mare a day during his first season nor more than 30 for the entire season. A mature jack may serve as many as two mares in a single day provided the two services are several hours apart. The number of mares a jack should serve during a season depends on the strength and vigor of the individual, but 70 or 80 mares probably is the maximum number that he can serve with satisfactory results. Artificial breeding may be employed if the jack is patronized very heavily. This not only conserves the vitality of the jack but also enables the owner to breed a much larger number of mares. If care and precaution are taken, artificial breeding may be practiced with as much success as breeding in the natural way. In fact, some mares which do not conceive from natural service are successfully impregnated artificially. It is sometimes advisable to use a stallion for teasing purposes in order to conserve the jack when the patronage is heavy.

FEEDS FOR THE JACK.

The jack is a rather sluggish animal, and for this reason his feeds should be slightly laxative in character. Bran, oats, crushed barley, and oil meal are splendid grain feeds to use. Sheaf oats and green feeds are also very satisfactory. Corn should be used only in limited amounts. Many jack breeders obtain good results by feeding sheaf oats, clover, and alfalfa hay.

THE BROOD MARE.

Sound brood mares of good quality should be selected in order to be successful in producing high-grade mules. Considerable effort is usually expended by the breeders of work horses in selecting good mares for breeding purposes, but no consistent effort is usually made by the mule breeder in exercising the same care in selecting brood mares for the production of mules. The idea seems to prevail that

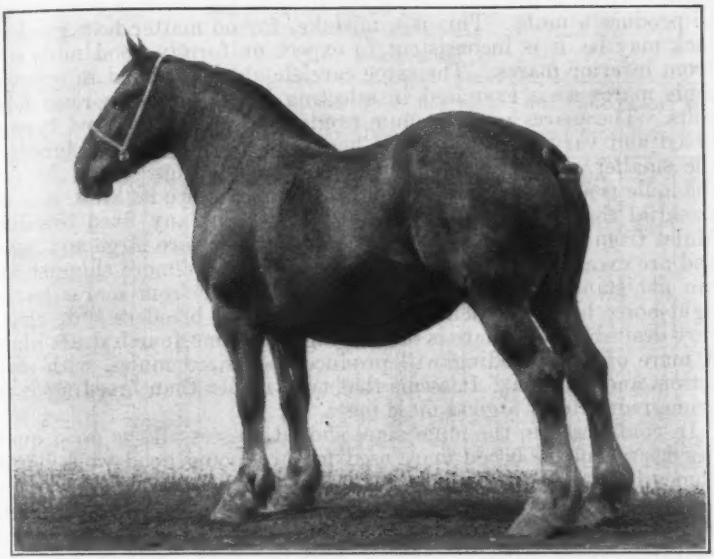


FIG. 4.—A desirable type of brood mare for producing draft mules. Note the "breediness," substance, and conformation of this mare.

FIG. 5.—A desirable type of light "mule mare" for producing mules of quality. Note roominess of body, short back, depth of heart girth, and "breediness" of this mare.

19497°—36——2

a mare which is not suitable for breeding to a stallion is good enough to produce a mule. This is a mistake, for no matter how good the jack may be, it is inconsistent to expect uniformly good mule colts from inferior mares. The same care should be applied in selecting mule mares as is exercised in selecting brood mares to raise horse colts. The mares used in mule production are of no fixed type or breed and vary from the large, heavy mares of the draft breeds to the smaller mares of the light-horse breeds (Figs. 4 and 5). As the mule is a work animal which can not reproduce its kind, it is not essential that mares for producing them be of any fixed breeding. Mules from the larger mares of the draft breeds are large and heavy and are excellent for draft purposes, but they are more sluggish and can not stand heat so well as mules produced from mares having light-horse blood in their veins. Experienced breeders state that a very desirable mule mare is one having about one-fourth draft blood. A mare of this breeding will produce good-sized mules, with style, action, and stamina. It seems that type rather than breeding is the prime requisite of a good mule mare.

In conformation the mule mare should possess all the good qualities desired in the brood mare used for producing good work horses. Some of the most important points of the good mule mare are:

A broad chest and large heart girth, indicating a vigorous constitution; a roomy barrel to allow for full development of the fetus; a straight back, strongly muscled over the loins; well-set legs with broad, flat bone, sound and of good quality; large and well-shaped feet; and feminine character, indicating "breediness." To sum up, the mare should combine size with quality, type, soundness, and breediness. The last term includes a variety of characteristics which makes the mare a good mother.

BREEDING THE MARE.

The mare will come in heat, on an average, every 18 to 21 days and will remain in heat from 2 to 4 days, though exceptional mares vary in this respect and remain in heat only a few hours. The mare usually comes in heat on the ninth day after the foal is dropped. In order to avoid accidents at breeding time, hobbles should always be put on the mare. Conception is more likely to take place if the mare is rested for a few hours at time of service. The mare should be returned to the jack in from 18 to 21 days after service, in order to make sure that conception has taken place.

TABLE 1.—*Calendar showing time of service and date of foaling based on 340-day gestation period for mares.*

Day of month mare is bred.	Date of foaling.											
	Bred in Jan.	Bred in Feb.	Bred in Mar.	Bred in Apr.	Bred in May.	Bred in June.	Bred in July.	Bred in Aug.	Bred in Sept.	Bred in Oct.	Bred in Nov.	Bred in Dec.
	Dec.	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May.*	*June.*	*July.*	*Aug.*	*Sept.*	*Oct.*	*Nov.*
1	6	6	3	6	5	6	5	6	6	5	6	5
2	7	7	4	7	6	7	6	7	7	6	7	6
3	8	8	5	8	7	8	7	8	8	7	8	7
4	9	9	6	9	8	9	8	9	9	8	9	8
5	10	10	7	10	9	10	9	10	10	9	10	9
6	11	11	8	11	10	11	10	11	11	10	11	10
7	12	12	9	12	11	12	11	12	12	11	12	11
8	13	13	10	13	12	13	12	13	13	12	13	12
9	14	14	11	14	13	14	13	14	14	13	14	13
10	15	15	12	15	14	15	14	15	15	14	15	14
11	16	16	13	16	15	16	15	16	16	15	16	15
12	17	17	14	17	16	17	16	17	17	16	17	16
13	18	18	15	18	17	18	17	18	18	17	18	17
14	19	19	16	19	18	19	18	19	19	18	19	18
15	20	20	17	20	19	20	19	20	20	19	20	19
16	21	21	18	21	20	21	20	21	21	20	21	20
17	22	22	19	22	21	22	21	22	22	21	22	21
18	23	23	20	23	22	23	22	23	23	22	23	22
19	24	24	21	24	23	24	23	24	24	23	24	23
20	25	25	22	25	24	25	24	25	25	24	25	24
21	26	26	23	26	25	26	25	26	26	25	26	25
22	27	27	24	27	26	27	26	27	27	26	27	26
23	28	28	25	28	27	28	27	28	28	27	28	27
24	29	29	26	29	28	29	28	29	29	28	29	28
25	30	30	27	30	29	30	29	30	30	29	30	29
26	31	31	28	31	30	31	30	31	31	30	31	30
	Jan.	*Feb.*	*Mar.*	*Apr.*	*May.*	*June.*	*July.*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
27	1	1	1	1	1	1	1	1	1	1	1	1
28	2	2	2	2	2	2	2	2	2	2	2	2
29	3	.....	3	3	3	3	3	3	3	3	3	3
30	4	.....	4	4	4	4	4	4	4	4	4	4
31	5	.....	5	.....	5	.....	5	5	.....	5	.....	5

CARE OF THE PREGNANT MARE.

There should be no sudden changes in feed or work of the mare after she becomes pregnant. She should be given a well-balanced ration of feed that will supply the needs of her own body as well as those of the growing fetus. Feeds that are too fattening should be avoided, also moldy or damaged hay, as there is a suspicion that either may cause abortion. Exercise is a most important essential to the health of the pregnant mare, as well as for the development of a strong, healthy foal. The best and most economical way of giving this exercise is by using the mare in regular farm work. The pregnant brood mare should not be subjected to hard pulls or severe strains. By using care and judgment the mare may be safely worked up to within a week or ten days of foaling. The average gestation period of mares—that is, the length of time that they carry their foals—is about 340 days. This period varies slightly with individual mares. It is important that a careful record be kept of the date of service to the jack in order that the time of foaling may be anticipated. A very sure sign that the foal will be dropped in a short while is the appearance of wax on the teats, which usually appears two or three days before parturition.

XUM

CARE OF MARE AT FOALING TIME.

About a week or ten days before the foal is expected the mare should be turned into a pasture or paddock, where there is no danger of injury from other animals. If the weather is mild, a paddock or pasture is a desirable place for the foal to be delivered. There is probably less danger of infection in a pasture than in a stable. If desirable conditions for foaling outside can not be provided for, a roomy box stall that has been well cleaned out, disinfected, and bedded with fresh straw should be provided.

It is well to observe the mare closely when the foal is expected, in order that assistance may be given in delivery if necessary. It will be necessary for the attendant to be where he can see the mare and yet be unseen by her. Should she need assistance, a veterinarian should be summoned at once. If it is essential that aid be given, the service should be rendered by one who has had experience with and understands the many phases of difficult parturition.

If the foal has been delivered satisfactorily, the attendant should remove as soon as possible any tissue or matter that may be clogging its nostrils and see that respiration is started. Assistance may be rendered in this respect by blowing into the foal's nostrils and rubbing its sides with a cloth or wisp of straw. As soon as practicable, without disturbing the mare unnecessarily, remove the afterbirth from the proximity of the mare and, if foaling occurred in a stable, clean out the bedding that has been soiled during parturition, sprinkle lime on the floor where the bedding has been removed, and supply fresh bedding.

To prevent infection, the navel cord of the foal should be saturated with full-strength tincture of iodin or a solution of 1 to 1,000 corrosive sublimate, and then dusted with powdered slaked lime. This should be repeated each day until the navel cord drops off. A normal foal will usually find its own way to the mare's udder soon after arrival. If, however, the foal is weak and unable to stand within two or three hours after birth, it should be assisted in getting its first meal. It is very important that the newborn foal get the first milk from its dam, which is a substance called colostrum. In addition to having the food properties so much needed by the new born, the colostrum also has a purgative effect, which stimulates the action of the digestive tract in eliminating the fecal matter already collected during the period of gestation. If this fecal matter is not eliminated within 24 hours after the colt is born, a dose of castor oil (2 to 4 tablespoons) shaken well in milk should be given and repeated in three or four hours until the desired results are obtained.

CARE OF MARE AND FOAL.

The mare should receive bran mashes and light feeds until she has recovered from the effects of foaling and the feverish condition of her system has disappeared. The ration should then be increased gradually until the mare is on full feed.

When the weather is warm and pleasant, the mare and foal may be turned out on pasture or paddock as soon as the foal is able to follow, as exercise is very beneficial and they will thrive better in the open.

If the mare was being worked prior to foaling, she will be ready for work again in 10 days or two weeks after the colt is born. When this is done the colt should be confined in a stable or paddock and not permitted to follow in the fields. The mare and colt will fret for each other for a while, but they will soon become accustomed to separation. When working, the mare should be returned to the stable once in the forenoon and in the midafternoon to allow the colt to suckle. The mare should be allowed to cool before being turned in with the colt, as there is danger of causing the colt to have scours and other digestive troubles if the mare is overheated when nursing.

When the mare is idle during the fly season, it is best to keep her and her foal in a darkened stable in the day and turn them out on pasture at night. The mare should be fed some grain and hay, as grass alone will not supply the needs of her body and also provide a sufficient milk flow for the colt.

The colt usually begins to eat a small amount of grain at the age of three or four weeks. Oatmeal should be the first grain fed and bran may be added later. Best results in feeding grain to colts in the open are obtained by building a creep under which they may pass at all times and which will prevent the mares or other mature horses from reaching the feed provided for the colts. The colt will eat only a little grain at first, but it is worth much to have it begin eating a small amount as soon as possible, because the more accustomed it becomes to eating grain while young the less trouble there will be at weaning time. The mare may be induced to frequent the creep by giving her an occasional feed near there also.

WEANING THE COLT.

Under ordinary conditions the colt is usually weaned when about six months old, but if the mare is working and the colt is thrifty it may be weaned earlier. When the colt has been taught to eat grain early, this separation from its dam need not cause any check in the colt's development. This is a trying time in the life of a colt, however, and it should receive additional feed and care to make up for the loss of the mother's milk from its ration. When the colt is once taken away from the mare, the separation should be made complete.

The mare requires some individual attention at weaning time. It will be necessary to milk her by hand for a few days to prevent too much milk from collecting in the udder and causing it to become caked and swollen. To assist in the drying-up process, the mare should be milked only partially dry and if the milk flow is maintained the grain ration should be reduced for a few days.

CARE OF THE COLT AFTER WEANING.

At no time in the colt's life is pasture more important than at the time of weaning. On being taken away from its dam, the colt needs succulent feed and the best way of supplying this feed is by having a good pasture. Not only is a good pasture necessary for the development of the colt, but it is also necessary if the colt is to be raised in an economical manner. In addition to the pasture the colt should

receive liberal amounts of grain and hay. Half of its growth is made during its first year and it should have every advantage possible for its development. Colts like companionship and they do better if several are allowed to run together (Fig. 6).

THE ORPHAN COLT.

It may happen sometimes that the mare dies soon after foaling or fails to give milk enough for her foal. When either of these misfortunes occurs the colt must be raised by hand, which is a tedious undertaking but is worth while if done properly. As a feed for the orphan colt, the best and most practical substitute for mare's milk is cow's milk after it has been prepared to conform as nearly as possible

FIG. 6.—Mule foals like companionship. A group of weanlings on pasture.

in composition to the milk of the mare. This is done by selecting milk that is low in butterfat and diluting it with one part of fresh water for three parts of milk. Add a tablespoon of sugar and three or four tablespoons of limewater to a pint of this diluted milk and heat to body temperature. Give the foal about a half teacup of this prepared milk at first and at short intervals gradually increase the amount and the length of time between feeding periods as the foal develops. A bottle with a rubber nipple attached is the most convenient way to give milk to the orphan. As the foal suckles frequently in small amounts when following its dam, one should feed it frequently and thus conform as nearly to natural conditions as possible.

The utensils used in feeding the orphan foal should be kept scrupulously clean. This can be done by freely utilizing hot water and sunshine, both of which are enemies to germs that collect and thrive in milk containers.

SPRING OR FALL COLTS.

The climatic conditions and nature of the farm work determine largely whether it is best to have the colts come in the spring or in the fall.

The natural breeding season for mares is in the spring, which is the generally accepted time to have colts. There are, however, several advantages of having fall colts, especially in the South. The fall-born colt comes at a time when the mare can probably be more easily spared from farm work and at a time when flies are not so abundant. Another advantage is that the fall colt is weaned at a time when it can be turned on to pasture and its development is not retarded at this critical time. The spring colt is weaned at a time when the grazing season is practically over.

EDUCATING THE COLT.

The time to begin the education of the colt is early in its life. It should be halterbroken and taught to be led when a few weeks old. The more the colt is handled when young the fewer difficulties will be encountered later when it is desired to put him to work.

Mules reach maturity at the age of 5 years, but they may be given light work when 3 years old. Care should be taken not to overload young mules. Overtaxing the young animal not only tends to check its development but also causes it to become unreliable as a worker, and possibly balky. A young mule that becomes accustomed to moving a load every time it is called upon will develop into a reliable work animal.

FEEDING AND CARE OF MULES.

Too little thought and attention are usually given to the proper methods of management and feeding of mules. Where the use of mules as work stock prevails, the feeding is usually done in a haphazard manner without regard to efficiency and economy. The essentials of a good caretaker are judgment and common sense combined with some knowledge of feeds. The most practical feeds to use are those which are grown on the farm or plantation so far as they provide the essential nutrients for a balanced ration. Corn, oats, and barley are the most widely used grains, as there is hardly a section of the United States where one or more of these grains are not grown. These grains may be combined to make a satisfactory feed or taken singly and supplemented with such feeds as bran, oil meal, or cottonseed meal to make a balanced ration. A balanced ration is one which will supply the protein and carbohydrate elements in such proportion as to meet as nearly as possible the body requirements of the animal for doing the work which it is to perform.[2] The same principles that are used in the correct feeding of horses may also be applied to the feeding of mules. As a general rule 1.1 pounds of grain and 1¼ pounds of hay daily per 100 pounds of live weight will be found to be about the right amount of feed to use for an animal at medium work. The exact

[2] Methods of computing a balanced ration are fully explained in Farmers' Bulletin 1030, Feeding Horses, which may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents a copy.

quantity of feed depends upon the individual animal and must be determined by the feeder.

While there are many cases in which mules are underfed, there are probably many others in which the owner suffers financially because the mules are fed more high-priced feeds than they really need, through the use of improperly balanced rations. Overfeeding is most likely to be done during the winter months, when the mules are idle. During this period idle mules may be kept in good condition largely on hay and straw and a small amount of grain. Mules that are worked hard and are receiving heavy rations should have their feed allowance diminished when idle. Idle mules thrive better if they are not confined in stables but are kept in the open.

Digestive disorders are more prevalent among work stock during the spring and summer months than at any other time. This is due to the improper feeding and watering of overheated animals. If the work animal appears to be excessively warm when brought in from work, it should be permitted to cool off before watering or feeding. Attention to such details will prevent many cases of colic. Mules sometimes suffer in hot weather from heat because they are allowed to eat too much grain or hay. This is most likely to occur when fresh, new hay is being fed. The hay ration should be fed mainly at night so that there will be several hours in which the mule may partly digest and assimilate this bulky feed before going to work.

Mules like to roll after being unharnessed, and they should have a place where they may rest themselves in this way. They will be much more comfortable in summer if they are turned out of their stables at night after they have cleaned up their feed. If they are turned on to pasture at night they will sweat more the next day, but the beneficial effects obtained from the grass and being in the open will more than offset the effects of excessive sweating. If unable to provide pasture for the mules at night during the summer, a paddock or lot should be provided where they may be comfortable.

JUDGING MULES.

The general form and appearance of the mule should resemble closely that of a horse, and in judging mules the same general points of perfection are looked for. The nearer the mule approaches the ideal desired in a draft horse the more valuable he is from a market standpoint. In the mule there are certain characteristics derived from his paternal side which are mainly indicated in his bray, disposition, ears, tail, and feet, aside from which the mule does not differ materially from the dam.

Mules vary in height from the little 12-hand pit mules to the large draft mules standing 17½ hands. The range in height of various classes of mules is given in another portion of this bulletin under "Market classes of mules."

The weight of mules varies from 600 pounds to 1,600 pounds. The average weight of the larger type of mules varies between 1,150 and 1,400 pounds and is the range of weight within which the majority of the most marketable mules are classified.

The form of the mule should be compact, with a deep body, broad chest, full flanks, short back, and well-sprung ribs. Light, waspy flanks, long narrow bodies, and long backs are not desirable.

Quality is rather difficult to define, but is that which every capable judge looks for in any animal. It is indicated in a mule by a trim, fine ear, clean-cut head and joints, flinty flat bone, well-defined tendons, and soft, silky hair. Quality marks the difference between a "market topper" and a "jar head." A short, thick ear, a coarse head, round, spongy bone, and a harsh coat of hair are indications which the judge should discriminate against.

The natural tendency of the mule is to be lazy and obstinate. An active, energetic mule is much desired.

It is in the hind quarters of the mule that the greatest faults of conformation are usually found. The croup is often very short

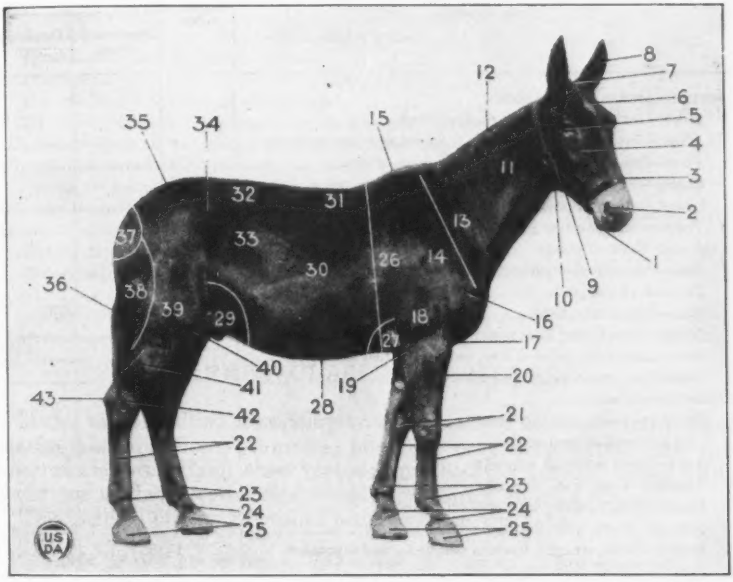


FIG. 7.—The points of the mule: 1, mouth; 2, nostril; 3, nose; 4, face; 5, eye; 6, forehead; 7, poll; 8, ear; 9, lower jaw; 10, throatlatch; 11, neck; 12, crest; 13, shoulder bed; 14, shoulder; 15, withers; 16, point of shoulder; 17, breast; 18, arm; 19, elbow; 20, forearm; 21, knees; 22, cannons; 23, fetlocks; 24, pasterns; 25, feet; 26, heart girth; 27, fore flank; 28, underline; 29, hind flank; 30, barrel; 31, back; 32, loin; 33, coupling; 34, hip; 35, croup; 36, tail; 37, buttock; 38, quarters; 39, thigh; 40, stifle; 41, gaskin; 42, hock; 43, point of hock.

and steep, the hips sloping, the thighs narrow, and the hind legs sickle shaped. These are faults of conformation that judges should discriminate against sharply. It is in the hind quarters and loins that the draft animal obtains propelling power. These portions of the animal, therefore, should be correctly built and properly developed. The loins should be broad, short, and thickly muscled; the croup, long and level; the hips long, level, and muscular; the thighs thick,

long, and well muscled; and the hind legs well set, with broad, clean-cut hocks and flat, dense bone. The mule should stand on good feet that are well shaped.

While the mule is essentially a draft animal, it is used widely for general utility purposes, especially in the South. Though style and action may not be so important qualities in a mule as they are in the lighter breeds of horses, these qualities add materially to its value. A smart, alert mule, with a long, free stride at the walk and a snappy, balanced trot is highly desired. Figure 7 and the accompanying score card give points in the study of conformation.

Score Card for the Mule.

Scale of points.	Standard score.	Points given animal judged.	
		Student's score.	Corrected score.
GENERAL APPEARANCE—16 points:			
Height—Estimated hands....; actual hands.....			
Weight—Estimated....; actual....; according to age and type....	4		
Form—Broad, deep, compact, smooth, symmetrical.....	4		
Quality—Clean, dense bone with sufficient substance; refined head and ears; fine hair; defined joints and tendons.....	4		
Temperament—Active; good disposition.....	4		
HEAD AND NECK—7 points:			
Head—Proportionate; clear-cut features.....	1		
Forehead—Broad, full.....	1		
Eyes—Full, bright, clear.....	1		
Muzzle—Broad, fine; large nostrils; trim and even lips.....	1		
Ears—Large, long, pointed, fine, well set, carried alert.....	1		
Neck—Long, muscular, clean-cut throatlatch.....	2		
FOREHAND—24 points:			
Shoulders—Long, sloping, smooth, muscular, blending into smooth, well-defined withers.....	3		
Arms—Short, muscular, elbow in.....	1		
Forearms—Long, wide, muscular.....	2		
Knees—Straight, wide, deep, well supported.....	2		
Cannons—Short, wide, flat, well-defined tendons.....	2		
Fetlocks—Wide, straight, tendons well back, well supported.....	1		
Pasterns—Of medium length, oblique (about 45°), clean, strong..	3		
Feet—Of medium size, set straight; dense, smooth horn; slope of wall parallel to pastern; wide, high heels; concave sole; strong bars; prominent, elastic frog.....	6		
Leg position—In front, a perpendicular line from point of shoulder should divide the leg and foot into lateral halves; from the side, a similar line from the bony prominence on shoulder blade should pass through the center of elbow, knee, and pastern joints, and meet the ground back of foot.....	4		
BODY—9 points:			
Chest—Deep, wide.....	2		
Ribs—Long, well sprung, close.....	2		
Back—Short, broad, strong.....	2		
Loin—Short, wide, muscular.....	2		
Flanks—Deep, full; long, low underline.....	1		

Score Card for the Mule—Continued.

Scale of points.	Standard score.	Points given animal judged.	
		Student's score.	Corrected score.
HIND QUARTERS—32 points:			
Hips—Wide, level, smooth, muscular	2		
Croup—Long, level, muscular	2		
Tail—Set high, well carried	1		
Quarters and thighs—Deep and muscular; strongly joined to gaskins	3		
Stifles—Broad, thick, strong	1		
Gaskins—(Lower thighs) long, wide, muscular	2		
Hocks—Straight, wide, prominent points, deep, flat, clean-cut, well supported	6		
Cannons—Similar to front, but a trifle longer and wider	2		
Fetlocks—Wide, straight, tendons well back	2		
Pasterns—Similar to front, but less sloping (about 55°)	3		
Feet—Similar to front, but not quite as large	4		
Leg position—From rear, a perpendicular line from point of buttock should divide the leg and foot into lateral halves; from the side, this same line should touch the point of hock and run parallel to the cannon. A similar line from hip joint should meet the ground midway between heel and toe	4		
ACTION—12 points:			
Walk—Active, straight, balanced, long stride	7		
Trot—Straight, long, free, regular, snappy stride	5		
Total	100		

MARKET CLASSES OF MULES.

Mules are classified according to their use. There are many local market classifications of mules, but they may be grouped into five general classes. Each class includes mules of a general type, while there are various grades and weights within a specific class.

The general classes of mules are shown in the table.

TABLE 2.—*Ranges in height and weight of various classes of mules.*[8]

Class.	Range in height.	Range in weight.
	Hands.	*Pounds.*
Draft	16 to 17½	1,200 to 1,600
Farm	15½ to 16	900 to 1,250
Sugar	16 to 17	1,150 to 1,300
Cotton	13½ to 15½	750 to 1,100
Mining	12 to 16	600 to 1,350

Each of the classes is graded according to conformation, soundness, quality, condition, and action into the following grades: Choice, good, medium, common, inferior.

[8] Market Classes and Grades of Horses and Mules. Bulletin 122, Illinois Agricultural Experiment Station, 2d ed. 1912.

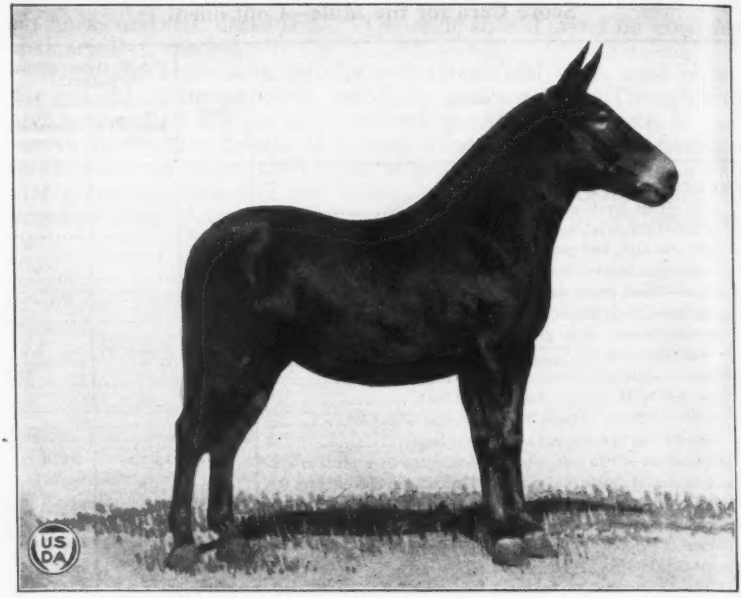


FIG. 8.—A choice draft mule. Champion mule at American Royal Livestock Show, Kansas City, Mo., 1922.

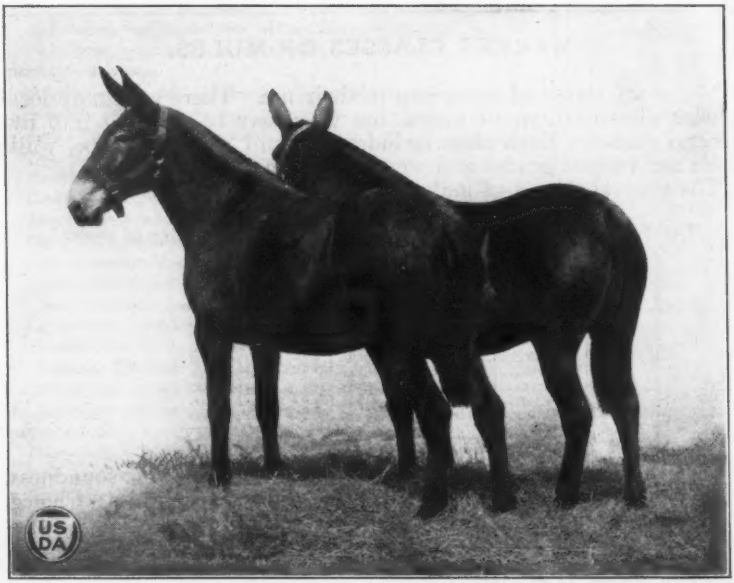


FIG. 9.—A pair of choice draft mules.

DRAFT MULES.

The draft-mule class includes the largest mules (Figs. 8, 9, 10), standing from 16 to 17½ hands and weighing from 1,200 to 1,600 pounds. Some exceptional draft mules exceed the maximum weight given for this class. They are used largely for heavy teaming in large cities, especially in the warmer climates; for contract jobs, such as road grading and railroad work; and for lumber work. Mules for contract work are usually designated by an appropriate descriptive name, such, for instance, as "railroaders." The heaviest draft mules find their way to the lumber camps. Contract mules

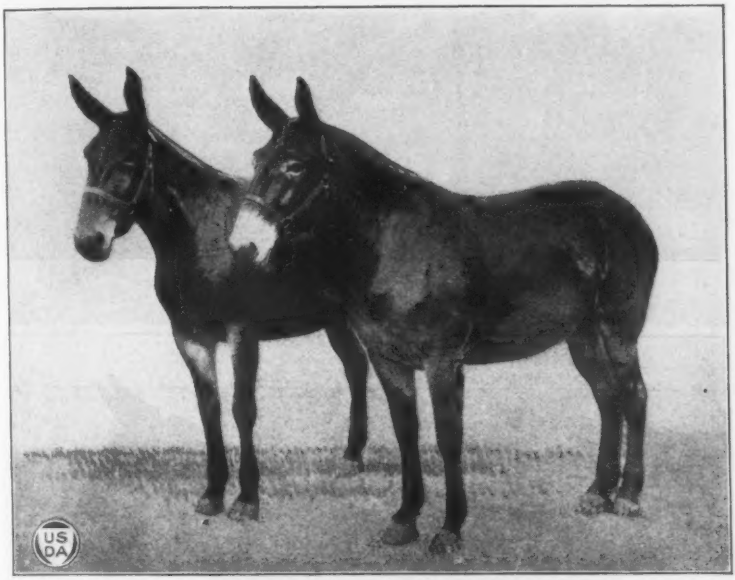


FIG. 10.—A pair of good draft mules.

must have more quality than lumber mules, but extreme weight is not so essential. The greatest demand for draft mules is for those between the ages of 5 and 8 years.

There is no special preference in regard to sex. The highest prices paid are for those mules having weight combined with heavy bone, large, well-shaped feet, strong, short backs, closely coupled with abundant muscling over the loin and hind quarters.

FARM MULES.

Mules purchased in the market for farm work in the Middle Western States are known as "farm mules." There is more variation in quality and type in this class than in any other class, as the demand for a specific type is not so well defined (Figs. 11, 12, 13, 14).

FIG. 11.—A pair of large farm mules.

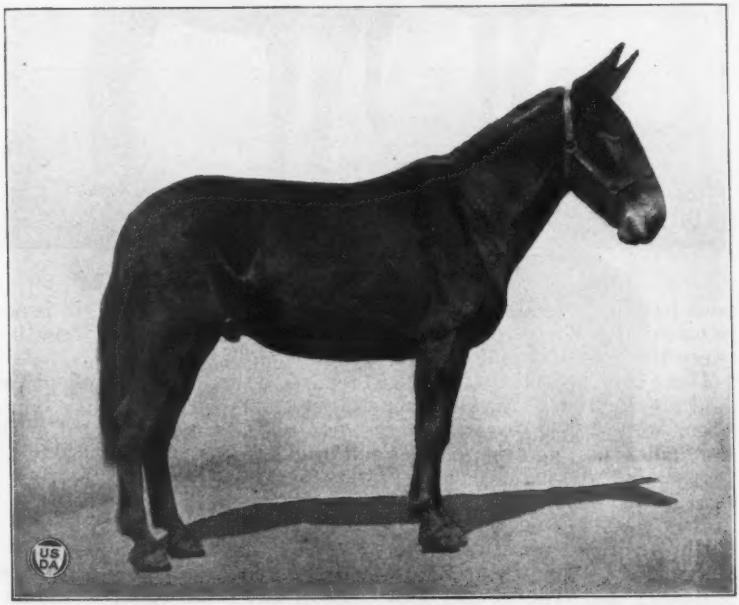


FIG. 12.—A good farm mule.

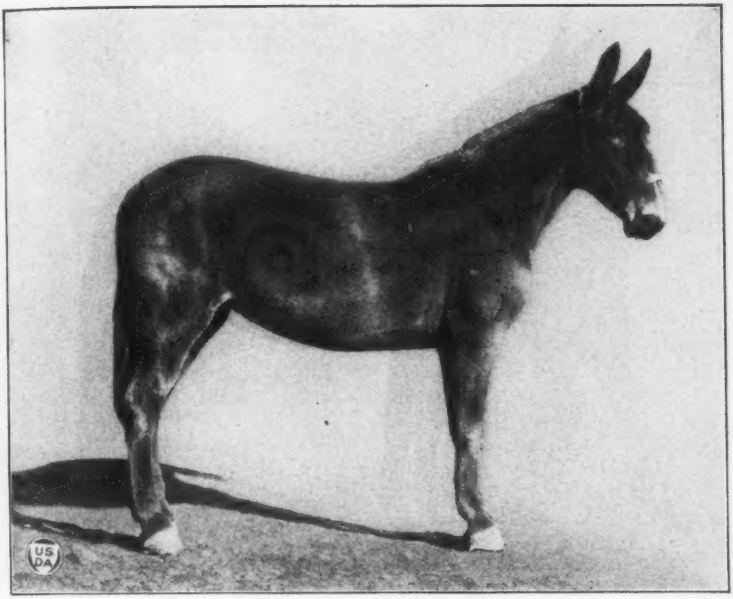


FIG. 13.—A medium farm mule.

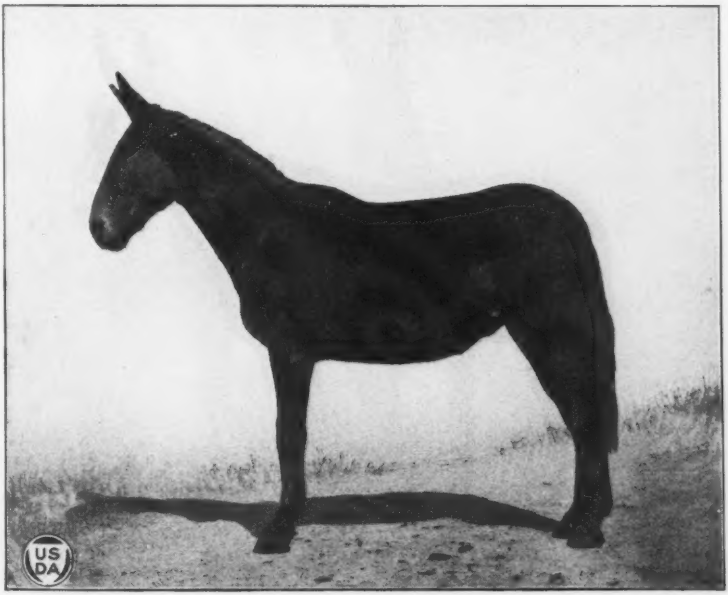


FIG. 14.—Common farm mule.

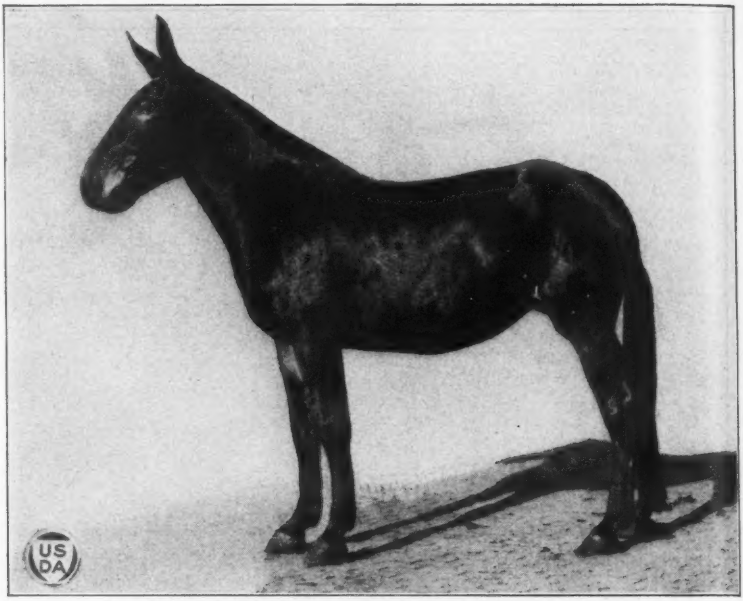


FIG. 15.—A choice sugar mule.

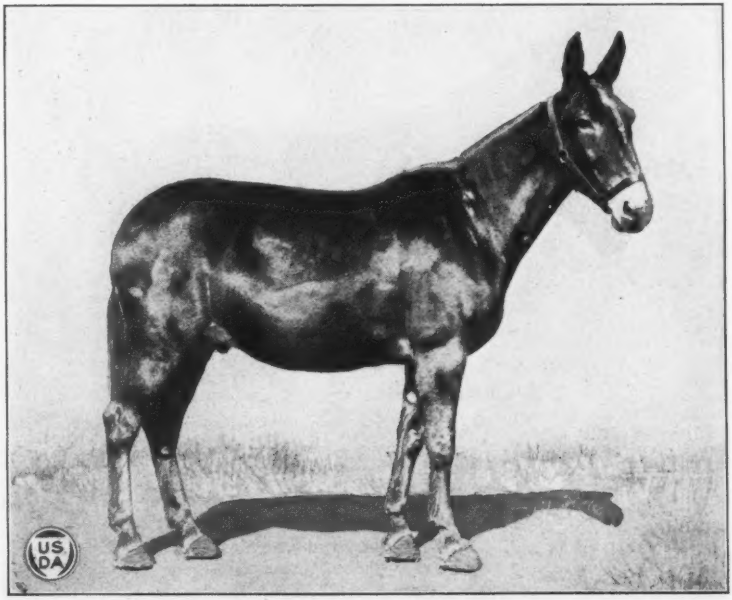


FIG. 16.—A good sugar mule.

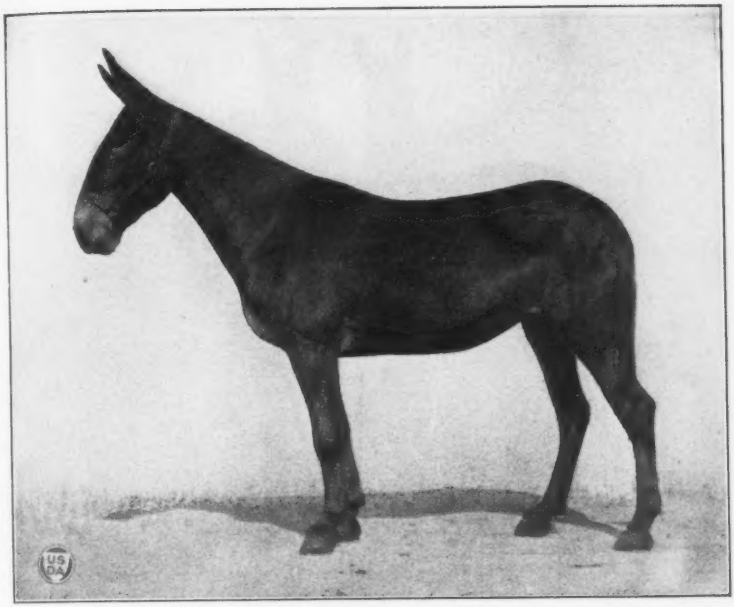


FIG. 17.—Common sugar mule.

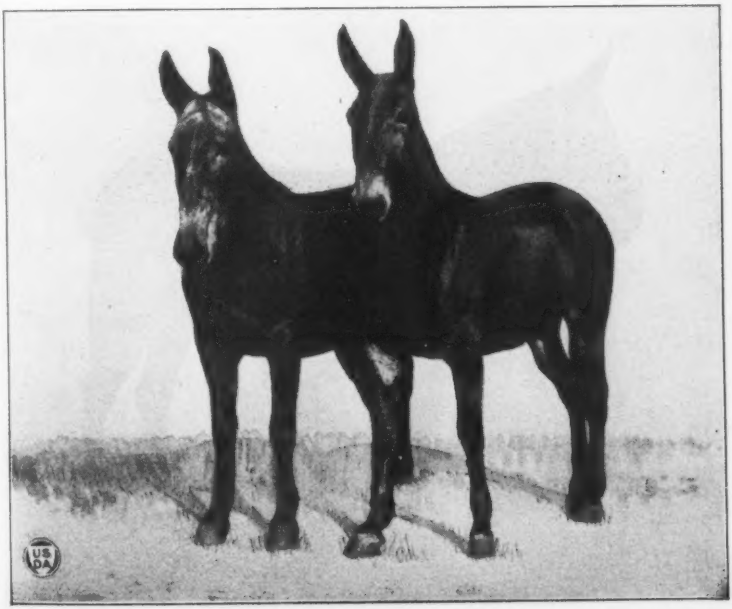


FIG. 18.—A team of choice cotton mules.

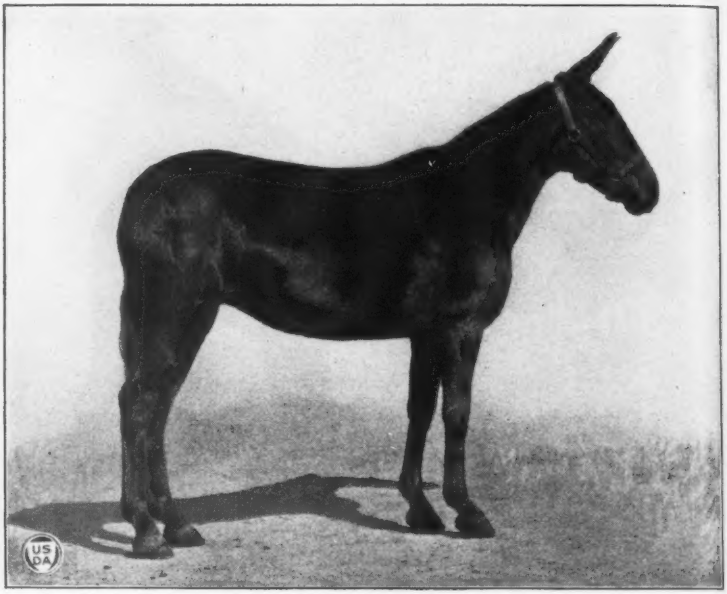


FIG. 19.—A good cotton mule.

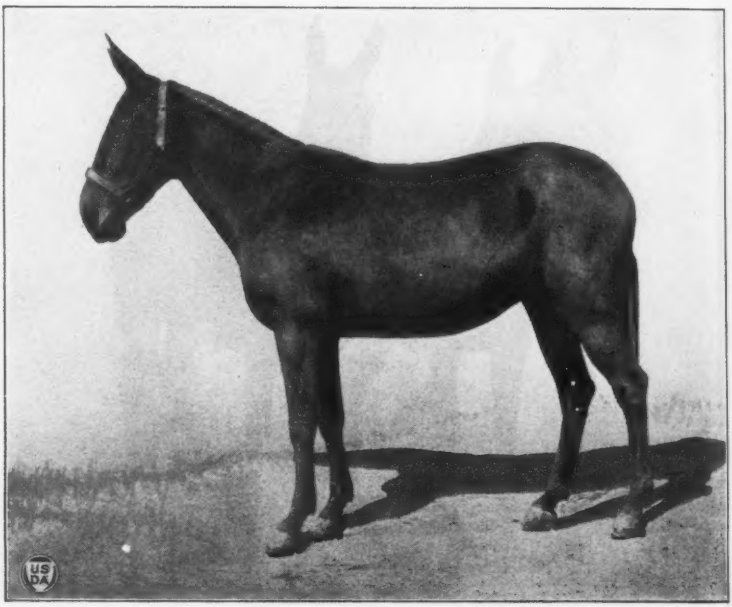


FIG. 20.—A medium cotton mule.

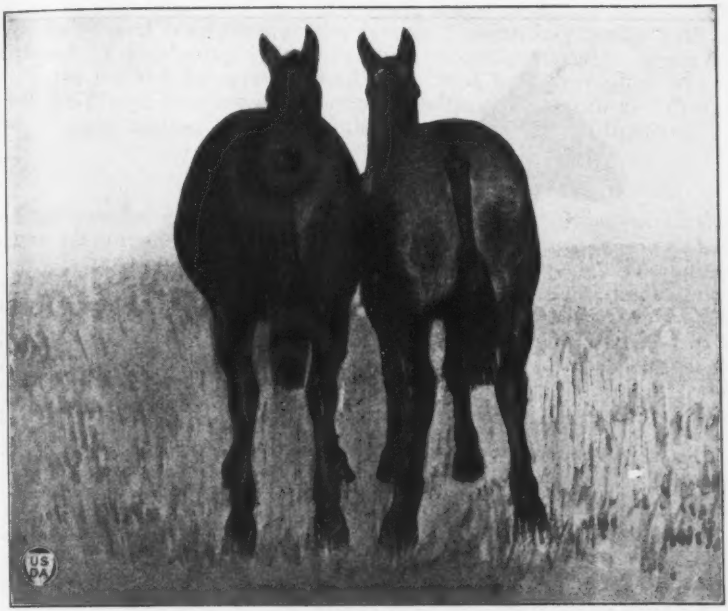


FIG. 21.—A team of choice surface mining mules.

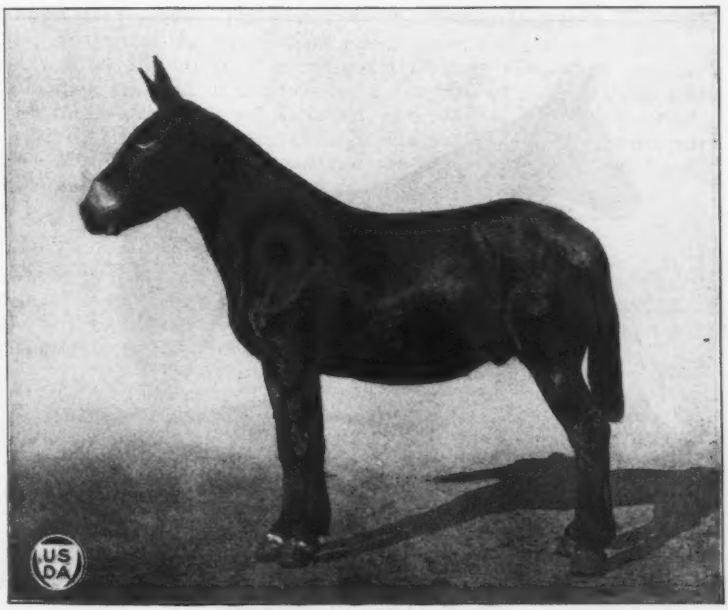


FIG. 22.—A choice surface mining mule.

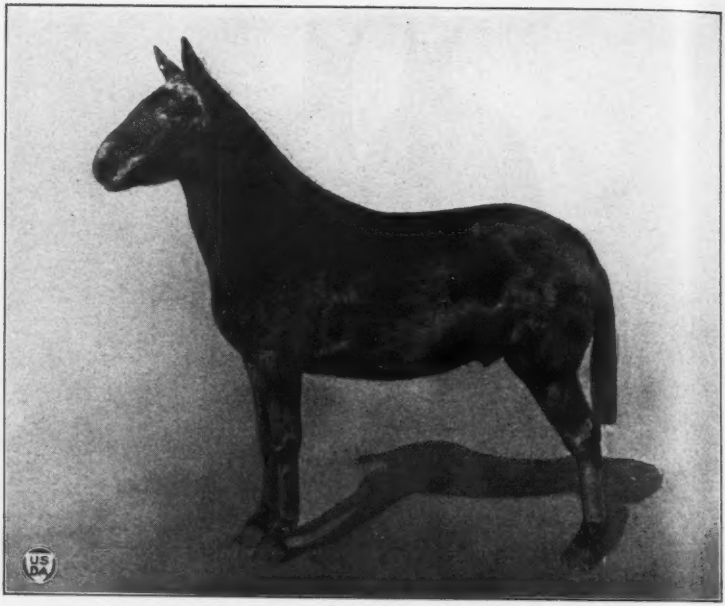


FIG. 23.—A choice pit mining mule.

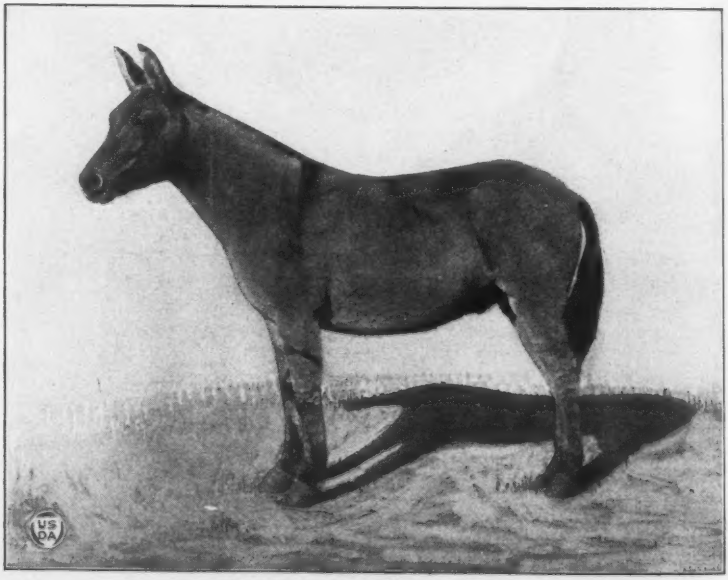


FIG. 24.—A good pit mining mule.

Mules in this class may be plain draft mules or cotton mules that lack finish and condition, as the farmer likes to buy mules with a prospect of developing them into more valuable animals. Many of them are worked for a season and then fitted for the market, where they are placed into one of the other specific classes, such as "drafters," "sugar mules," "cotton mules," "miners," or "railroaders."

SUGAR MULES.

Sugar mules are those which are purchased for shipment to the sugar plantations of the South. This class of mules is somewhat rangy in type and should have quality, style, and finish. The mules in this class are heavier and more compact than cotton mules, but not so heavy as draft mules. The range in weight is from 1,150 to 1,300 pounds. In selecting sugar mules special attention should be given to quality and adaptability to the work. The feet should be large and well shaped. Mare mules are preferred for the sugar trade (Figs. 15, 16, 17).

COTTON MULES.

As the name implies, cotton mules are purchased for cotton plantations. The type (Figs. 18, 19, 20) is somewhat lighter and more angular than the sugar or surface-mining mule and heavier than the pit mule. While there is a gradation of quality and age in this market class, the planters of the South are becoming more and more inclined to increased weight and quality in their mules than prevailed a few years ago. A choice cotton mule weighs about 1,150 pounds and is alert and active, but most mules in this class vary from 750 to 1,100 pounds. The custom in the Cotton Belt is to buy mules in the spring for the crop season and dispose of them in the fall. As they are usually in poor condition following the heavy summer's work, they are sold in the fall for a fraction of the purchase price. These mules are wintered, fattened, and sold back to the planter in the spring. For this reason the age limits within this class are variable. Mules from 5 to 7 years old are preferred, however, for this trade and bring the best prices.

MINING MULES.

There is a wide range in weight among mining mules, varying from 600-pound pit mules to 1,350-pound surface mules (Figs. 21, 22, 23, 24). Good feet and freedom from blemishes are requirements for mules to qualify for top prices for the mining trade.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE WHEN THIS PUBLICATION WAS LAST PRINTED

Secretary of Agriculture	HENRY A. WALLACE.
Under Secretary	REXFORD G. TUGWELL.
Assistant Secretary	M. L. WILSON.
Director of Extension Work	C. W. WARBURTON.
Director of Personnel	W. W. STOCKBERGER.
Director of Information	M. S. EISENHOWER.
Director of Finance	W. A. JUMP.
Solicitor	MASTIN G. WHITE.
Agricultural Adjustment Administration	CHESTER C. DAVIS, *Administrator.*
Bureau of Agricultural Economics	A. G. BLACK, *Chief.*
Bureau of Agricultural Engineering	S. H. MCCRORY, *Chief.*
Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Bureau of Biological Survey	IRA N. GABRIELSON, *Chief.*
Bureau of Chemistry and Soils	H. G. KNIGHT, *Chief.*
Bureau of Dairy Industry	O. E. REED, *Chief.*
Bureau of Entomology and Plant Quarantine	LEE A. STRONG, *Chief.*
Office of Experiment Stations	JAMES T. JARDINE, *Chief.*
Food and Drug Administration	WALTER G. CAMPBELL, *Chief.*
Forest Service	FERDINAND A. SILCOX, *Chief.*
Grain Futures Administration	J. W. T. DUVEL, *Chief.*
Bureau of Home Economics	LOUISE STANLEY, *Chief.*
Library	CLARIBEL R. BARNETT, *Librarian.*
Bureau of Plant Industry	FREDERICK D. RICHEY, *Chief.*
Bureau of Public Roads	THOMAS H. MACDONALD, *Chief.*
Soil Conservation Service	H. H. BENNETT, *Chief.*
Weather Bureau	WILLIS R. GREGG, *Chief.*

U. S. GOVERNMENT PRINTING OFFICE: 1936

For sale by the Superintendent of Documents, Washington, D. C. - - - - Price 5 cents

1341 rev.
Forest Service Library

U. S. DEPARTMENT OF AGRICULTURE
FARMERS' BULLETIN No. 1341 rev.
Feb 1938

MULE PRODUCTION

XUM

THE ABILITY of the mule to endure hardship and perform sterling service under adverse conditions has established him as a real asset in American agriculture.

The mule will give best service under favorable conditions of feeding and management.

Good, sound mares should be selected for breeding in order to be successful in producing high-grade mules. A very desirable "mule mare" is one having about one-fourth draft blood and three-fourths light-horse blood.

The most practical feeds to use for mules are those which are grown on the farm or plantation so far as they provide the essential nutrients for a balanced ration.

The general form and appearance of the mule should resemble closely that of a horse, and in judging mules the same general points of perfection should be looked for.

Mules range in height from 12 hands to 17½ hands and in weight from 600 pounds to 1,600 pounds.

While the mule is essentially a draft animal, it is used widely for utility purposes, especially in the South. A smart, alert mule, with a long, free stride at the walk and a snappy, balanced trot is highly desired.

Washington, D. C.

Issued August 1923
Revised February 1938

MULE PRODUCTION

By J. O. WILLIAMS, *associate animal husbandman, Animal Husbandry Division, Bureau of Animal Industry*

Revised by S. R. SPEELMAN, *associate animal husbandman, Animal Husbandry Division*

CONTENTS

	Page
Distribution of mules in the United States	1
Advantages of the mule as a work animal	2
Some peculiarities of the mule	2
Production of mules	3
Selecting the jack	4
Care of the jack	5
Feeds for the jack	6
The brood mare	6
Breeding the mare	7
Care of the pregnant mare	8
Care of mare at foaling time	9
Care of mare and foal	10
Weaning the foal	11
Care of the foal after weaning	11
Production of mules—Continued.	
The orphan foal	12
Spring or fall foals	12
Educating the foal	13
Feeding and care of mules	13
Judging mules	14
Score card for the mule	16
Market classes of mules	17
Draft mules	18
Farm mules	18
Sugar mules	22
Cotton mules	22
Mining mules	25

DISTRIBUTION OF MULES IN THE UNITED STATES

THE importance and popularity of the mule as a work animal are attested by its extensive use in farm operations. In 1910, the number of mules on farms and ranches in this country was 4,209,769. The number on January 1, 1920, increased to 5,432,391, and on January 1, 1935, the number was 4,818,160. Of the 4,818,160 mules on farms on January 1, 1935, 3,125,154, or approximately 65 percent, were in the nine Cotton Belt States, which in number of mules rank as follows:

Texas	889,329
Mississippi	350,481
Georgia	333,529
Alabama	321,613
Arkansas	307,160
North Carolina	295,388
Oklahoma	246,261
Louisiana	198,748
South Carolina	182,645
Total	3,125,154

The only States outside the Cotton Belt having more than 100,000 mules on farms in 1935 were Tennessee, with 304,827; Missouri, with 245,554; Kentucky, with 240,196; Illinois, with 114,618; and Kansas, with 103,465. The total number of horses on farms in the Cotton Belt States on January 1, 1935, was 1,596,229, which was about 51 percent of the number of mules. The only Cotton Belt State having more horses than mules in 1935 was Oklahoma with 425,485.

ADVANTAGES OF THE MULE AS A WORK ANIMAL

The mule is a hardy work animal. While this humble creature responds to good treatment and gives best service under favorable conditions of feeding and management, it is his ability to endure hardship and to perform sterling service under adverse conditions that has established him so firmly in American agriculture. Those who are stanch supporters of the mule say that, in comparison with the horse, he will live longer, endure more work and hardship, require less attention and feed, is less liable to digestive disorders, lameness, and disease, is more easily handled in large numbers, is less irritable, and is more capable of performing work in the hands of a mediocre or poor horseman. Whether or not all these claims may be substantiated, it is a fact that the mule is well established as a work animal in those sections where climatic conditions are severe, suitable feed often lacking, and horsemanship not a prevailing art (fig. 1).

FIGURE 1.—A pair of farm mules.

SOME PECULIARITIES OF THE MULE

The mule is an animal with possibly more eccentricities and undeniable virtues than any other domestic animal. One might suspect from his mixed heritage a rather unusual temperament requiring careful treatment, which is the case. The chief difficulty is to know just how to handle the mule in order to bring the desirable qualities of his maternal ancestry into the foreground and to keep subservient undesirable donkey characteristics. To treat consistently an animal having a combination of many good and bad qualities is a task which may tax the ability of even the best horseman. Yet the virtues of the mule have been so evident both in times of peace and in times of war that many ardent horse lovers who were once preju-

diced against him have come to admire the animal which has no "pride of ancestry or hope of posterity" (fig. 2).

There are some peculiarities which belong to the mule alone. He does not like to be hurried, worried, or cuffed about; to try to force him to do things against his will is practically impossible and only makes matters worse. The mule must be understood and gently but firmly persuaded to do things that are out of the ordinary. He is naturally suspicious of everybody who comes around him, and seems to have an uncanny way of detecting whether a person is going to treat him harshly or kindly. His reception is usually in like manner, nor does he forget the person who inflicts harsh treatment.

There is a wrong and a right way to lead a mule. A man who looks at a mule and lugs at his head will never make any progress. The mule will not be pulled. He will usually follow quietly, how-

FIGURE 2.—Many mules find their way into the United States Army. Good, sound mules with quality are required. This illustration shows representative types of "lead" and "wheel" mules in Army service.

ever, if a man walks away in the direction he desires to go. Neither can you "bully" mules into going through tight places; they are somewhat like sheep, and if the leader can be induced to go the rest will follow.

Next to satisfying a hearty appetite the height of mule joy is to roll. A mule will roll at every opportunity and often at inopportune times, when he makes the opportunity suit his own convenience. He dislikes mud and water holes in the road, does not work well on soft, muddy ground, and is what is known as a sure-footed animal.

PRODUCTION OF MULES

The mule is a hybrid animal having a jackass, commonly called a jack, for a sire and a mare for a dam. When the reverse cross is made and the female ass (or jennet) is bred to a stallion, the off-

spring is called a "hinny." As the mule will not reproduce (except in very rare instances), it is necessary to maintain both jacks and mares in order to produce mules.

SELECTING THE JACK

The importation of jacks, and consequently the production of mules in the United States, dates back to colonial times. About 1787 George Washington was presented with a jack by the King of Spain, which was used in the stud at Mount Vernon. Many good mules were produced in those days, and the value of the mule as a work animal was soon recognized by intelligent planters. It is

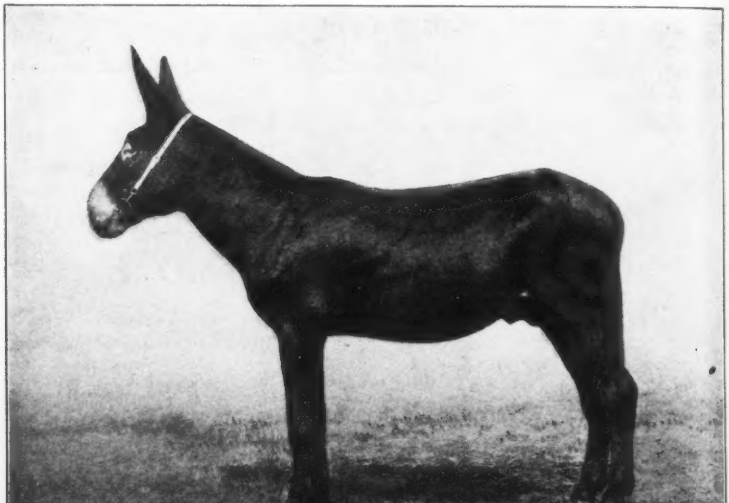


FIGURE 3.—A prize-winning jack. Note size of bone and general quality throughout.

only within the last 45 years, however, that the production of mules has become an extensive enterprise and that much attention has been given to the rearing and selection of the best jack stock.

The American jack of today is a composite of the bloods of some of the best foreign breeds, and in attaining the highest standard of excellence prevailing in the jack stock of the United States, the breeders have emphasized the valuable utility points so much desired in the best jacks, such as size, weight, bone, style, quality, and action. In the United States, jacks are usually spoken of as "jennet jacks" and "mule jacks." As these terms imply, jennet jacks are used for mating with jennets for the reproduction of the breed, and mule jacks are used for mating with mares for the production of mules. As commonly found, the jennet jack is a larger animal than the mule jack and is of superior conformation and quality.

A good mule jack (fig. 3) should be not less than 15 hands[1] high and possess plenty of weight, large bone with quality, style, and action. The most essential points of conformation in a good jack are: A straight strong back, closely coupled and well-muscled over the loin; a long, level rump; and a deep body with well-sprung ribs to allow ample room for lung development. Vigor and strength of constitution are indicated by a broad chest and large heart girth.

The legs should be set straight, be well-muscled, and have plenty of bone. The length of leg should be in proportion to the depth of the body; height obtained principally by length of leg is undesirable. The size of the bone is very important. It is usually determined by measuring the circumference of the cannon bone about half way between the knee and the fetlock joint. This should be about 8½ inches in a jack of 15 hands' height. It is also very desirable to have large, well-shaped feet and good, sound hocks. The head should be well-proportioned, with the profile of the nose straight or slightly Roman. The ears should be long, well-set, and alert on a mature animal and should measure, horizontally, 33 inches or more in length from tip to tip.

Measurements of a good jack[2]

[Weight, 1,200 pounds; height (standard measure), 15 hands, 3 inches]

	Inches		*Inches*
Ears from tip to tip	34	Around body at girth	70
Around face and jaw	39	Around body at loin	67
Around neck at throatlatch	36	Around hoof, below coronet (next to hair)	16½
Around arm	21	Above hock	17½
Around cannon	8½	Below hock	9½
Length from poll to tail	84		

Some of the common defects in jacks which should be avoided are: Flat, narrow chest, which indicates a weak constitution and lack of vigor; light-muscled loin and long coupling; short, drooping rump; excessive length of leg; light bone; poor hocks, with a tendency toward curbiness; small feet with contracted heels; and short or droopy ears.

CARE OF THE JACK

The proper care and management of the jack are somewhat exacting, as he is rather peculiar in his likes and dislikes. While a stallion may be spoiled because of his nervous temperament, the jack may be just as quickly ruined because of his inclination to be sluggish. The jack should have a caretaker who understands jack management thoroughly. This is very important, as the disposition of the jack is partly controlled by the groom. The jack should be quietly but firmly handled. A bad disposition in a jack is usually attributable to harsh handling or mismanagement of the animal when young. Through continuous observation the groom should learn the peculiar individuality of the jack and the little things required for his proper management.

Abundant exercise is one of the big factors in the management of a breeding animal. A roomy, well-ventilated, and well-lighted box stall opening to an exercising paddock is necessary for the proper

[1] A hand is a measurement of height equal to 4 inches.
[2] Twice champion at the Missouri State Fair and reserve champion at the World's Fair, San Francisco.

care of the jack. It is important that the exercising paddock be of good size. Moreover, in order to insure plenty of exercise, it is well to give the jack some road work.

A young jack intended for siring mules should not be permitted to run with jennets or mules, as this practice usually leads to difficulty in teaching him to serve mares, when used in the stud. Instead the young jack should have fillies or gentle mares for companions. The jack may begin serving mares at the age of 2 or 2½ years. At this early age he should be bred to only a few mares. When he is 3 years old he may serve 25 or 30 mares, but he should not be allowed more than one mating a day. A mature jack may serve as many as two mares in a single day provided the two services are several hours apart. The number of mares a jack should serve during a season depends on the strength and vigor of the individual, but 70 or 80 mares probably is the maximum number that he can serve with satisfactory results. Artificial breeding may be employed if the jack is patronized very heavily. This not only conserves the vitality of the jack but also enables the owner to breed a much larger number of mares. If care and precaution are taken, artificial breeding may be practiced with as much success as breeding in the natural way. In fact, some mares which do not conceive from natural service are successfully impregnated artificially. It is sometimes advisable to use a stallion for teasing purposes in order to conserve the jack when the patronage is heavy.

FEEDS FOR THE JACK

The jack is a rather sluggish animal, and for this reason his feeds should be slightly laxative in character. Wheat bran, oats, crushed barley, and linseed meal are splendid grain feeds to use. Sheaf oats and green feeds are also very satisfactory. Corn should be used only in limited quantities and preferably during winter months. Many jack breeders obtain good results by feeding a ration of sheaf oats, clover, and alfalfa hay. In summer a good-sized grass paddock is very helpful, both as a source of feed and for conditioning purposes.

THE BROOD MARE

Only sound brood mares of good quality should be selected in producing high-grade mules. Breeders of work horses usually take particular care in choosing good mares for breeding purposes, but ordinarily no consistent effort is made by mule breeders in selecting mares for the production of mules. The idea seems to prevail that a mare which is not suitable for breeding to a stallion is good enough to produce a mule. This is a mistake, for no matter how good the jack may be, it is inconsistent to expect uniformly good mule foals from inferior mares. The same care should be applied in selecting mule mares as is exercised in selecting brood mares to raise horse colts.

The mares used in mule production are generally of no fixed type or breed and vary from large, heavy draft mares to smaller mares of the light-horse type (figs. 4 and 5). As the mule is a work animal which cannot reproduce its kind, it is not essential that mares used for producing them be of any fixed breeding. It is very necessary, however, that the mares be of the correct size and type. Mules

foaled from mares of the draft type are large and heavy and are excellent for draft purposes, but they are more sluggish in temperament and cannot stand the heat so well as mules produced from mares having light-horse blood in their veins. Mules produced from mares of the light-horse type, on the other hand, are usually too small to be of greatest value because their dams were not large enough. Because of these facts, experienced breeders state that a very desirable mule mare is one having about one-fourth draft blood and three-fourths light-horse blood. A mare of this breeding will weigh between 1,100 and 1,500 pounds and will produce good-sized mules, with style, action, and stamina.

In conformation the mule mare should possess all the good qualities desired in the brood mare used for producing good work horses.

FIGURE 4.—A desirable type of brood mare for producing draft mules. Note the "breediness," substance, and conformation of this mare.

Some of the most important points of the good mule mare are: A broad chest and large heart girth, indicating a vigorous constitution; a roomy barrel to allow for full development of the fetus; a straight back, strongly muscled over the loins; well-set legs with broad, flat, sound bone of good quality; large, well-shaped feet; and feminine character, indicating "breediness." To sum up, the mare should combine size with quality, type, soundness, and breediness. The last term includes a variety of characteristics which makes the mare a good mother.

BREEDING THE MARE

The mare will come in heat, on an average, every 18 to 21 days and will remain in heat from 2 to 4 days, though exceptional mares

vary in this respect and remain in heat only a few hours. The mare usually comes in heat on the ninth day after the foal is dropped. In order to avoid accidents at breeding time, hobbles should always be put on the mare. Conception is more likely to take place if the mare is rested for a few hours at time of service. The mare should be returned to the jack in from 18 to 21 days after service, in order to make sure that conception has taken place.

CARE OF THE PREGNANT MARE

There should be no sudden changes in feed or work of the mare after she becomes pregnant. She should be given a well-balanced ration of feed that will supply the needs of her own body as well as

FIGURE 5.—A desirable type of light "mule mare" for producing mules of quality. Note roominess of body, short back, depth of heart girth, and "breediness" of this mare.

those of the growing fetus. Feeds that are too fattening should be avoided, also spoiled feeds such as moldy or damaged hay, as there is danger that they may cause abortion. Exercise is a most important essential to the health of the pregnant mare, as well as for the development of a strong, healthy foal. The best and most economical way of giving this exercise is by using the mare in regular farm work. The pregnant brood mare should not be subjected to hard pulls or severe strains, however, and the severity of the work should be regulated to fit the stage of pregnancy. It is advisable to lighten the work generally as pregnancy advances. If proper care and judgment are used, the mare may safely be worked up to within a week or 10 days of foaling. The average gestation period of mares—that is, the length of time that they carry their foals—is about 340 days. This period varies slightly with individual mares.

It is important that a careful record be kept of the date of service to the jack in order that the time of foaling may be anticipated (table 1). A very sure sign that the foal will be dropped in a short while is the appearance of wax on the teats, which usually occurs 2 or 3 days before parturition.

TABLE 1.—*Calendar showing time of service and date of foaling based on 340-day gestation period for mares*

Day of month mare is bred	Date of foaling											
	Bred in Jan.	Bred in Feb.	Bred in Mar.	Bred in Apr.	Bred in May	Bred in June	Bred in July	Bred in Aug.	Bred in Sept.	Bred in Oct.	Bred in Nov.	Bred in Dec.
	Dec.	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*
1	6	6	3	6	5	6	5	6	6	5	6	5
2	7	7	4	7	6	7	6	7	7	6	7	6
3	8	8	5	8	7	8	7	8	8	7	8	7
4	9	9	6	9	8	9	8	9	9	8	9	8
5	10	10	7	10	9	10	9	10	10	9	10	9
6	11	11	8	11	10	11	10	11	11	10	11	10
7	12	12	9	12	11	12	11	12	12	11	12	11
8	13	13	10	13	12	13	12	13	13	12	13	12
9	14	14	11	14	13	14	13	14	14	13	14	13
10	15	15	12	15	14	15	14	15	15	14	15	14
11	16	16	13	16	15	16	15	16	16	15	16	15
12	17	17	14	17	16	17	16	17	17	16	17	16
13	18	18	15	18	17	18	17	18	18	17	18	17
14	19	19	16	19	18	19	18	19	19	18	19	18
15	20	20	17	20	19	20	19	20	20	19	20	19
16	21	21	18	21	20	21	20	21	21	20	21	20
17	22	22	19	22	21	22	21	22	22	21	22	21
18	23	23	20	23	22	23	22	23	23	22	23	22
19	24	24	21	24	23	24	23	24	24	23	24	23
20	25	25	22	25	24	25	24	25	25	24	25	24
21	26	26	23	26	25	26	25	26	26	25	26	25
22	27	27	24	27	26	27	26	27	27	26	27	26
23	28	28	25	28	27	28	27	28	28	27	28	27
24	29	29	26	29	28	29	28	29	29	28	29	28
25	30	30	27	30	29	30	29	30	30	29	30	29
26	31	31	28	31	30	31	30	31	31	30	31	30
	Jan.	*Feb.*	*Mar.*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
27	1	1	1	1	1	1	1	1	1	1	1	1
28	2	2	2	2	2	2	2	2	2	2	2	2
29	3	-------	3	3	3	3	3	3	3	3	3	3
30	4	-------	4	4	4	4	4	4	4	4	4	4
31	5	-------	5	-------	5	-------	5	5	-------	5	-------	5

CARE OF MARE AT FOALING TIME

About a week or 10 days before the foal is expected the mare should be turned into a pasture or grassy paddock, where there is no danger of injury from other animals. If the weather is mild, a paddock or pasture is a desirable place for the foal to be delivered, as there is usually less danger of infection there than in a stable. If desirable conditions for foaling outside cannot be obtained, a roomy box stall that has been well cleaned out, disinfected, and bedded with fresh straw should be provided.

It is well to observe the mare closely when the foal is expected, in order that assistance may be given in delivery if necessary. To do this it will be necessary for the attendant to be where he can see the mare and yet be unseen by her. Should she need assistance, a veterinarian should be summoned at once. If it is essential that aid be given immediately, the service should be rendered by one who has had experience with and understands the many phases of difficult parturition. In normal presentation of the fetus, either the forelegs

XUM

extended with the head resting on them or the hind legs extended will first make their appearance through the vulva.

If the foal has been delivered satisfactorily, the attendant should remove as soon as possible any tissue or material that may be clogging its nostrils and see that respiration is started. Assistance may be rendered in this respect by blowing into the foal's nostrils, working its ribs, and rubbing its sides with a cloth or wisp of straw. As soon as practicable, without disturbing the mare unnecessarily, remove the afterbirth from the proximity of the mare and, if foaling occurred in a stable, clean out the bedding that has been soiled during parturition, sprinkle lime on the floor where the bedding has been removed, and supply fresh bedding.

To prevent infection, the navel cord of the foal should be saturated with full-strength tincture of iodine or a solution of 1 to 1,000 bichloride of mercury, and then dusted with powdered slaked lime. This should be repeated each day until the navel cord drops off. A normal foal will usually find its own way to the mare's udder soon after arrival. If, however, the foal is weak and unable to stand within 2 or 3 hours after birth, it should be assisted in getting its first meal. It is very important that the newborn foal get the first milk from its dam, which is a substance called colostrum. In addition to having the food properties so much needed by the newborn, the colostrum also has a purgative effect, which stimulates the action of the digestive tract in eliminating the fecal matter already collected during the period of gestation. If this fecal matter is not eliminated within 24 hours after the foal is born, a dose of castor oil (2 to 4 tablespoons) shaken well in warm milk should be given and repeated in 3 or 4 hours until the desired results are obtained. It also may be advisable to inject either warm water or 2 ounces of castor oil into the bowels through the anus.

CARE OF MARE AND FOAL

The mare should receive only bran mashes and other light feeds such as oatmeal gruel until she has recovered from the effects of foaling and the feverish condition of her system has disappeared. The ration should then be increased gradually until the mare is again on full feed.

If the mare has been on pasture before parturition and when the weather is warm and pleasant, the mare and foal may be kept on pasture or paddock as soon as the foal is able to follow. The exercise they will get in this way is very beneficial, and they will thrive better in the open. If the mare was worked prior to foaling, she will probably be ready for work again in 10 days or 2 weeks after the foal is born. When this is done the foal should be confined in a stable or paddock and not permitted to follow the mare in the fields. The mare and foal will fret for each other for a while, but they will soon become accustomed to separation. When working, the mare should be returned to the stable once in the forenoon and in the midafternoon to allow the foal to suckle. The mare should be allowed to cool before being turned in with the foal, however, as there is danger of causing the foal to have scours and other digestive troubles if the mare is overheated when nursing.

When the mare is idle during the fly season, it is best to keep her and her foal in a darkened stable in the day and turn them out on pasture at night. The mare should be fed some grain and hay during the summer, because grass alone will not supply the needs of her body and also provide a sufficient milk flow for the foal.

The foal usually begins to eat a small quantity of grain at the age of 3 or 4 weeks. Oatmeal should be the first grain fed, and wheat bran may be added later. Best results in feeding grain to foals in the open are obtained by building a creep into which they may pass at all times and which will prevent the mares or other mature horses from reaching the feed provided for the foals. The foal will eat only a little grain at first, but it is worth much to have it begin eating a small quantity as soon as possible, because the more accustomed it becomes to eating grain while young, the less trouble there will be at weaning time. The mare may be induced to frequent the creep by giving her an occasional feed near there also.

WEANING THE FOAL

Under ordinary conditions the foal is usually weaned when about 6 months old, but if the mare is working or again in foal and the foal is thrifty it may be weaned earlier. When the foal has been taught to eat grain early, this separation from its dam need not cause any check in the foal's development. Weaning is a trying time in the life of a foal, however, and it should receive additional feed and care to make up for the loss of the mother's milk from its ration. When the foal is once taken away from the mare, the separation should be made complete.

The mare also requires some individual attention at weaning time. When separated from her foal, it will be necessary to milk her by hand several times daily for a few days to prevent too much milk from collecting in the udder and causing it to become caked and swollen. To assist in the drying-up process, the mare should be milked only partially dry; if the milk flow is maintained the grain ration should be reduced for a few days.

CARE OF THE FOAL AFTER WEANING

At no time in the foal's life is pasture more important than at the time of weaning. On being taken away from its dam, the foal needs succulent feed, and the best way of supplying this feed is by having a good pasture. Not only is a good pasture necessary for the development of the foal, but it is also necessary if the foal is to be raised in an economical manner. In addition to the pasture the foal should receive liberal quantities of grain and hay. A grain mixture which will be suitable for the young foal may be made of 4 parts oats, 1 part corn, and 1 part wheat bran. The hay should be either mixed hay of good quality or clean, well-cured legume hay. Half of the foal's growth is made during its first year, and it should have every advantage possible for maximum development. Foals like companionship and do better if several are allowed to run together (fig. 6).

THE ORPHAN FOAL

It may happen sometimes that the mare dies soon after foaling or fails to give milk enough for her foal. When either of these misfortunes occurs the foal must be raised by hand, which is a tedious undertaking but is worth while if done properly. As a feed for the orphan foal, the best and most practical substitute for mare's milk is cow's milk after it has been prepared to conform as nearly as possible in composition to the milk of the mare. This is done by selecting milk that is low in butterfat and diluting it one-half with fresh water. Add a tablespoon of sugar and 3 or 4 teaspoons of limewater to a pint of this diluted milk and heat to body temperature. Give the foal about a half teacup of this prepared milk at first and feed at short intervals. Gradually increase the quantity per feeding and the length of time between feeding periods as the

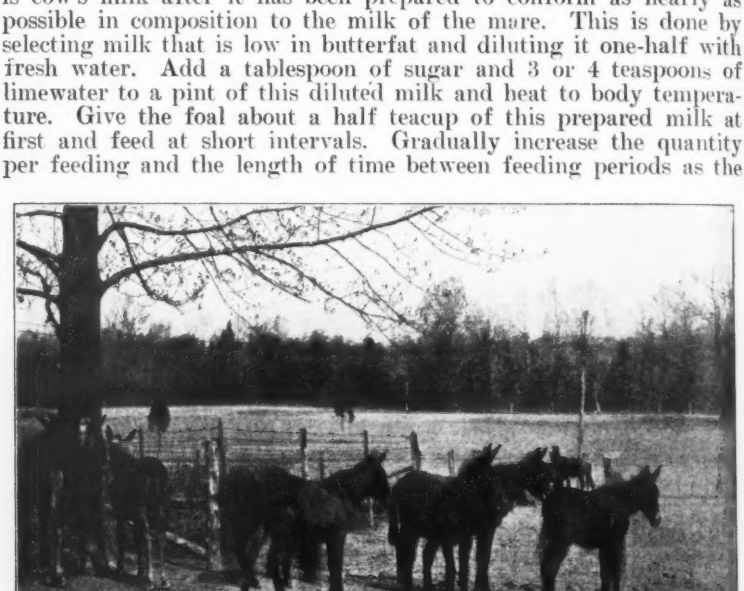


FIGURE 6.—Mule foals like companionship. A group of weanlings on pasture.

foal develops. A bottle with a rubber nipple attached is the most convenient way to give milk to the orphan.

The utensils used in feeding the orphan foal should be kept scrupulously clean. This can be done by freely utilizing hot water and sunshine, both of which are enemies to germs that collect and thrive in milk containers.

SPRING OR FALL FOALS

The climatic conditions and nature of the farm work determine largely whether it is best to have the foals come in the spring or in the fall.

The natural breeding season for mares is in the spring, which is the generally accepted time to have foals. There are, however, several advantages of having fall foals, especially in the South. First, the fall-born foal comes at a time when the mare can probably be more easily spared from farm work and at a time when flies are

not so abundant. Another advantage is that the fall foal is weaned when it can be turned on to pasture, and its development is not retarded at this critical time. To raise fall foals successfully, where climatic conditions are unfavorable, it is essential that housing facilities be adequate to take care of the young stock during winter weather.

EDUCATING THE FOAL

The time to begin the education of the foal is early in its life. It should be halter-broken and taught to lead when a few weeks old. The more the foal is handled when young, the fewer will be the difficulties encountered later when it is desired to put him to work.

Mules reach maturity at the age of 5 years, but they may be given light work when 3 years old. Care should be taken, however, not to overload young mules. Overtaxing the young animal not only tends to check its development but also causes it to become unreliable as a worker, and possibly balky. A young mule that becomes accustomed to moving a load every time it is called upon will develop into a reliable work animal.

FEEDING AND CARE OF MULES

Too little thought and attention are usually given to the proper methods of management and feeding of mules. Where the use of mules as work stock prevails, the feeding is sometimes done in a rather haphazard manner without regard to efficiency and economy. The essentials of a good caretaker are judgment and common sense, combined with a knowledge of feeds. Ordinarily the most practical feeds to use are those which are grown on the farm or plantation so far as they provide the essential nutrients for a balanced ration.[3] Corn, oats, and barley are the most widely used grains, as there is hardly a section of the United States where one or more of them are not grown. These grains may be combined or taken singly and supplemented with such feeds as wheat bran, linseed meal, or cottonseed meal to help make a balanced ration.

With the concentrates there should be fed dry roughage of various kinds such as Johnson grass, timothy, clover, alfalfa, soybean, cowpea, and prairie hays. Some of these may be used alone, but others should be fed in combination for best results. The best roughage to feed depends principally upon the kind of grain used. Where oats are the main concentrate the roughage may be largely carbonaceous hays, such as Johnson grass, timothy, or prairie hay. If corn is the principal grain used, however, a good mixed hay will generally prove most satisfactory. It is rarely advisable to use a legume hay, such as alfalfa, as the sole roughage although such a feed may make up as much as two-thirds of the total roughage allowance when the grain fed is highly carbonaceous. The principles that are used in the correct feeding of horses may be applied to the feeding of mules. As a general rule $1\frac{1}{10}$ pounds of grain and $1\frac{1}{4}$ pounds of good hay

[3] A balanced ration is one which will supply the protein, carbohydrate, and mineral elements in such proportion as to meet as nearly as possible the body requirements of the animal for doing the work which it is to perform. Methods of computing a balanced ration are fully explained in Farmers' Bulletin 1030, Feeding Horses, which may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents a copy.

daily per 100 pounds of live weight will be found to be about the right quantity of feed to use for an animal at medium work. For heavy work it will be necessary to increase the quantity of grain to 1¼ or 1⅓ pounds, but no more roughage will be needed. In fact it is sometimes advisable to reduce the roughage allowance somewhat below the 1¼-pound standard specified for medium work, when mules are worked hard. The exact quantity of feed in all instances depends upon the individual animal and must be determined by the feeder.

While there are numerous cases in which mules are underfed, there are many others in which the owner suffers financially because the mules are fed more high-priced feeds than they really need, through the use of large, improperly balanced rations. Overfeeding is most likely to be done during the winter months when the mules are idle. During this period, idle mules may be kept in good condition largely on hay, straw, corn stover, and a small quantity of grain. Mules that are worked hard and are receiving heavy rations should have their grain feed allowance diminished approximately one-half when temporarily idle. Idle mules thrive better if they are not confined in stables but are kept in the open, preferably on pasture.

Digestive disorders are more prevalent among work stock during the spring and summer months than at any other time. This is because overheated animals are improperly fed and watered. If the mule appears to be excessively warm when brought in from work, it should be permitted to cool off before being watered or fed. Attention to such details will prevent many cases of colic. Mules sometimes suffer in hot weather from heat because they are allowed to eat too much grain or hay. This is most likely to occur when fresh, new hay is being fed. The hay ration should be fed mainly at night so that there will be several hours in which the mule may partly digest and assimilate this bulky feed before going to work.

Mules like to roll after being unharnessed, and they should have a place where they may enjoy themselves in this way. Moreover, they will be much more comfortable in summer if they are turned out on pasture at night after they have cleaned up their feed. When turned onto pasture at night they will sweat more the next day, but the beneficial effects obtained from the grass and being in the open will more than offset the effects of excessive sweating. If one is unable to supply pasture for the mules at night during the summer, a paddock or lot should be provided where they may be comfortable.

JUDGING MULES

The general form and appearance of the mule should closely resemble that of a horse, and in judging mules the same general points of perfection are to be looked for. The nearer the mule approaches the ideal desired in a draft horse the more valuable he is from a market standpoint. In the mule there are certain characteristics derived from his paternal side which are mainly indicated in his bray, disposition, ears, tail, and feet, aside from which the mule does not differ materially from the dam.

Mules vary in height from the little 12-hand pit mule to the large draft mules standing 17½ hands. The range in height of various

classes of mules is given in another portion of this bulletin under Market classes of mules.

The weight of mules ranges from 600 to 1,600 pounds. The average weight of the larger type of mules ranges between 1,150 and 1,400 pounds and is the range of weight within which the majority of marketable mules are classified.

The form of the mule should be compact, with a deep body, broad chest, full flanks, short back, and well-sprung ribs. Light, waspy flanks, long, narrow bodies, and long backs are not desirable.

Quality is rather difficult to define, but is that which every capable judge looks for in any animal. It is indicated in the mule by a trim, fine ear, clear-cut head and joints, flinty, flat bone, well-defined

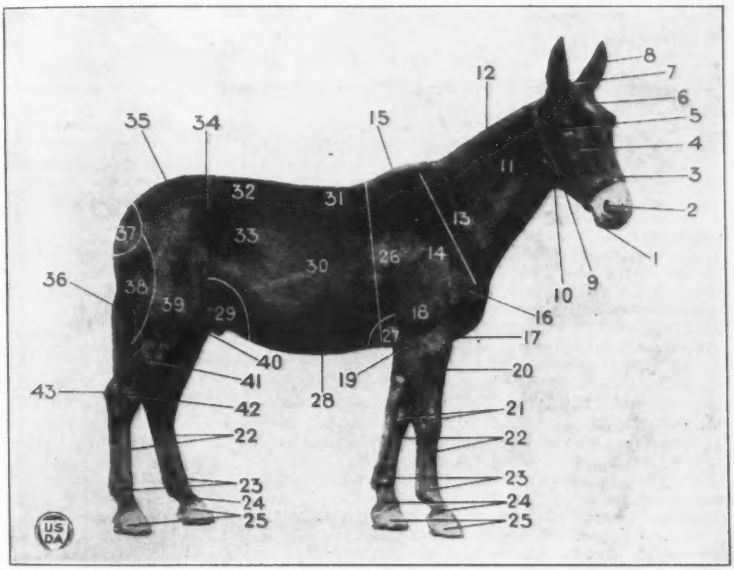


FIGURE 7.—The points of the mule: 1, Mouth; 2, nostril; 3, nose; 4, face; 5, eye; 6, forehead; 7, poll; 8, ear; 9, lower jaw; 10, throatlatch; 11, neck; 12, crest; 13, shoulder bed; 14, shoulder; 15, withers; 16, point of shoulder; 17, breast; 18, arm; 19, elbow; 20, forearm; 21, knees; 22, cannons; 23, fetlocks; 24, pasterns; 25, feet; 26, heart girth; 27, foreflank; 28, underline; 29, hindflank; 30, barrel; 31, back; 32, loin; 33, coupling; 34, hip; 35, croup; 36, tail; 37, buttock; 38, quarters; 39, thigh; 40, stifle; 41, gaskin; 42, hock; 43, point of hock.

tendons, and soft hair. Quality often marks the difference between a "market topper" and a "jar head." A short, thick ear, a coarse head, round, spongy bone, and a hard coat of hair are indications of poor quality against which the judge should discriminate.

The natural tendency of the mule is to be lazy and obstinate. An active, energetic mule is therefore much desired.

It is in the hindquarters of the mule that the greatest faults of conformation are usually found. The croup is often very short and steep, the hips too sloping, the thighs too narrow, the bone too light, and the hind legs sickle-shaped. These are faults of conformation that judges should discriminate against sharply. It is in the hind-

XUM

quarters and loins that the draft animal obtains propelling power. These portions of the animal, therefore, should be correctly built and properly developed. The loins should be broad, short, and thickly muscled; the croup long and level; the hips long, level, and muscular; the thighs thick, long, and well-muscled; and the hind legs well-set, with broad, clean-cut hocks, and flat, dense bone. Also, the mule should stand on sound, well-shaped feet.

Although the mule is essentially a draft animal, it is often used for general-utility purposes, especially in the South. Style and action may not be as important qualities in a mule as they are in the light breeds of horses, but when present they add materially to its value. A smart, alert mule, with a long, free stride at the walk and a snappy, balanced trot is highly desired. Figure 7 and the accompanying score card give points in the study of mule conformation.

SCORE CARD FOR THE MULE

Scale of points	Standard score	Points given animal judged	
		Student's score	Corrected score
GENERAL APPEARANCE—16 points:			
Height—Estimated hands....; actual hands.....			
Weight—Estimated....; actual....; according to age and type	4		
Form—Broad, deep, compact, smooth, symmetrical	4		
Quality—Clean, dense bone with sufficient substance; refined head and ears; fine hair; well defined joints and tendons	4		
Temperament—Active; good disposition	4		
HEAD AND NECK—7 points:			
Head—Proportionate; clear-cut features	1		
Forehead—Broad, full	1		
Eyes—Full, bright, clear	1		
Muzzle—Broad, fine; large nostrils; trim and even lips	1		
Ears—Large, long, pointed, fine, well set, carried alert	1		
Neck—Long, muscular, clean-cut throatlatch	2		
FOREHAND—24 points:			
Shoulders—Long, sloping, smooth, muscular, blending into smooth, well-defined withers	3		
Arms—Short, muscular, elbow in	1		
Forearms—Long, wide, muscular	2		
Knees—Straight, wide, deep, well supported	2		
Cannons—Short, wide, flat, well-defined tendons	2		
Fetlocks—Wide, straight, tendons well back, well supported	1		
Pasterns—Of medium length, oblique (about 45°), clean, strong	3		
Feet—Of medium size, set straight; dense, smooth horn; slope of wall parallel to pastern; wide, high heels; concave sole; strong bars; prominent, elastic frog	6		
Leg position—In front, a perpendicular line from point of shoulder should divide the leg and foot into lateral halves; from the side, a similar line from the bony prominence on shoulder blade should pass through the center of elbow, knee, and pastern joints, and meet the ground back of foot	4		
BODY—9 points:			
Chest—Deep, wide	2		
Ribs—Long, well sprung, close	2		
Back—Short, broad, strong	2		
Loin—Short, wide, muscular	2		
Flanks—Deep, full; long, low underline	1		

SCORE CARD FOR THE MULE—Continued

Scale of points	Standard score	Points given animal judged	
		Student's score	Corrected score
HIND QUARTERS—32 points:			
Hips—Wide, level, smooth, muscular	2		
Croup—Long, level, muscular	2		
Tail—Set high, well carried	1		
Quarters and thighs—Deep and muscular; strongly joined to gaskins	3		
Stifles—Broad, thick, strong	1		
Gaskins (Lower thighs)—Long, wide, muscular	2		
Hocks—Straight, wide, prominent points, deep, flat, clean-cut, well supported	6		
Cannons—Similar to front, but a trifle longer and wider	2		
Fetlocks—Wide, straight, tendons well back	2		
Pasterns—Similar to front, but less sloping (about 55°)	3		
Feet—Similar to front, but not quite as large	4		
Leg position—From rear, a perpendicular line from point of buttock should divide the leg and foot into lateral halves; from the side, this same line should touch the point of hock and run parallel to the cannon. A similar line from hip joint should meet the ground midway between heel and toe	4		
ACTION—12 points:			
Walk—Active, straight, balanced, long stride	7		
Trot—Straight, long, free, regular, snappy stride	5		
Total	100		

MARKET CLASSES OF MULES

On the large markets mules are classified according to their use. There are also various local market classifications of mules, but in general mules may be grouped in five classes. Each class includes mules of a general type, while there are various grades and weights within a specific class.

The general classes of mules are shown in table 2.

TABLE 2.—*Ranges in height and weight of various classes of mules*[1]

Class	Range in height	Range in weight
	Hands	*Pounds*
Draft	16 to 17½	1,200 to 1,600
Farm	15½ to 16	900 to 1,250
Sugar	16 to 17	1,150 to 1,300
Cotton	13½ to 15½	750 to 1,100
Mining	12 to 16	600 to 1,350

[1] From Bull. 122, Illinois Agricultural Experiment Station (second edition) Market Classes and Grades of Horses and Mules.

Each of the classes is divided, according to conformation, soundness, quality, condition, and action, into the following grades: Choice, Good, Medium, Common, Inferior.

DRAFT MULES

The draft-mule class includes the largest mules (figs. 8, 9, and 10), standing from 16 to 17½ hands high and weighing from 1,200 to 1,600 pounds. Some exceptional draft mules exceed the maximum weight given for this class. Draft mules are used principally for heavy teaming in large cities, especially in the warmer climates; for contract jobs, such as road grading and railroad work; and for lumber work. Mules used for contract work are generally designated by an appropriate descriptive name, such as "railroaders." The heaviest draft mules usually find their way to the lumber camps. Contract mules must have more quality than lumber mules, but extreme

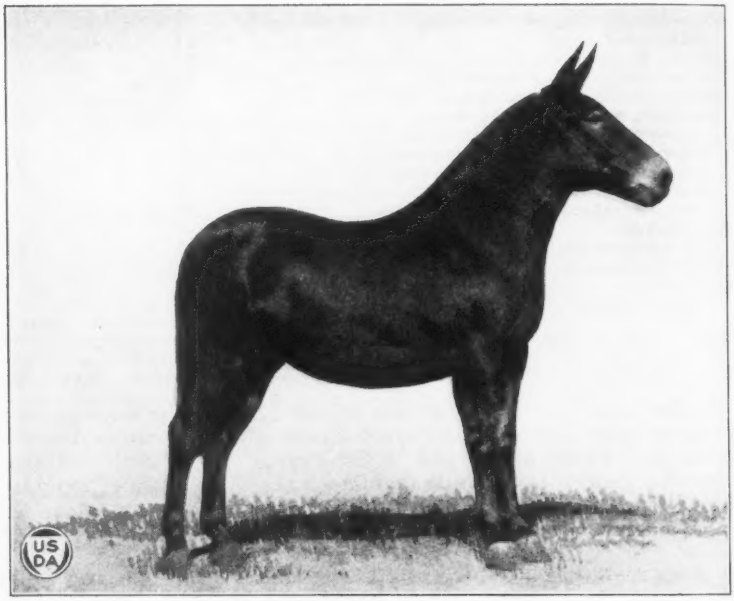


FIGURE 8.—A Choice draft mule.

weight is not so essential. The greatest demand for draft mules is for those between the ages of 5 and 8 years.

There is no special preference in regard to sex. The highest prices paid are for those mules having weight combined with heavy bone, large, well-shaped feet, strong, short backs, closely coupled with abundant muscling over the loin and hindquarters.

FARM MULES

Mules purchased on the market for farm work in the Middle Western States are known as "farm mules." There is more variation in quality and type in this class than in any other class, as the demand for a specific type is not so well defined (figs. 11, 12, 13, and 14). Mules in this class may be plain draft mules or cotton mules that

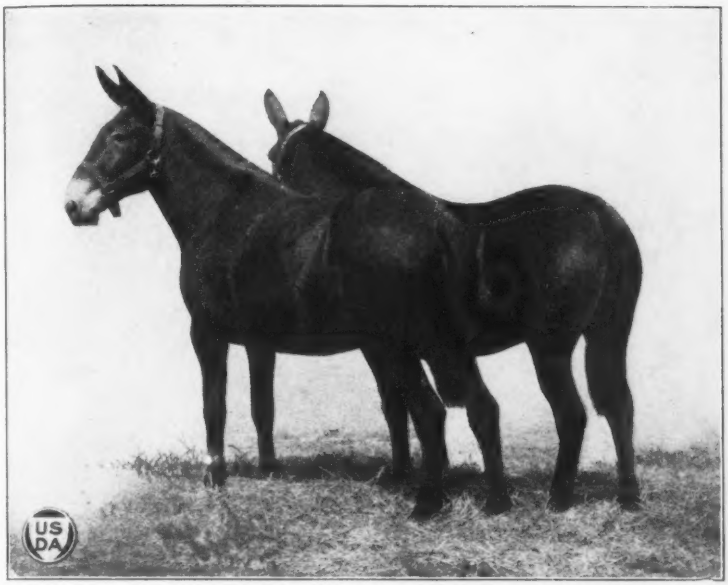


FIGURE 9.—A pair of Choice draft mules.

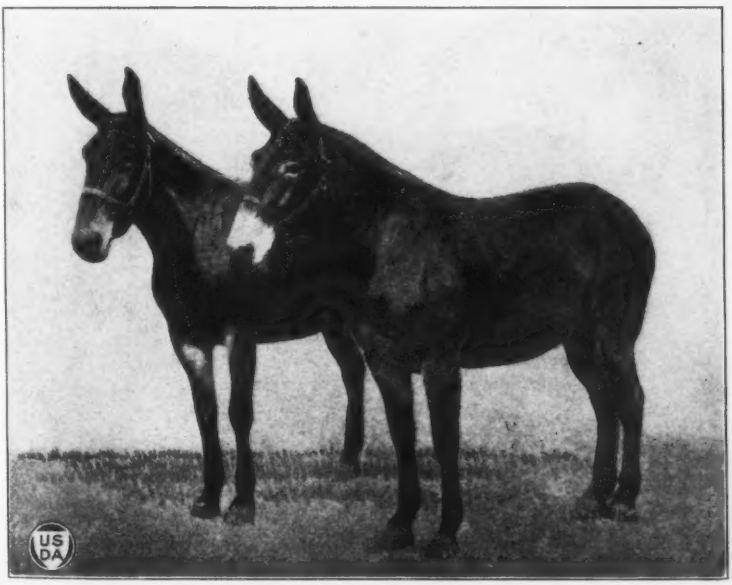


FIGURE 10.—A pair of Good draft mules.

FIGURE 11.—A pair of large farm mules.

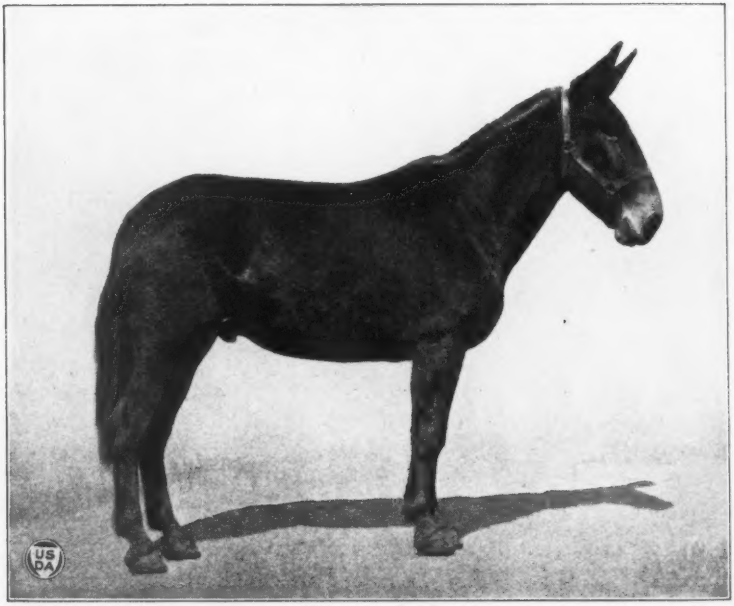


FIGURE 12.—A Good farm mule.

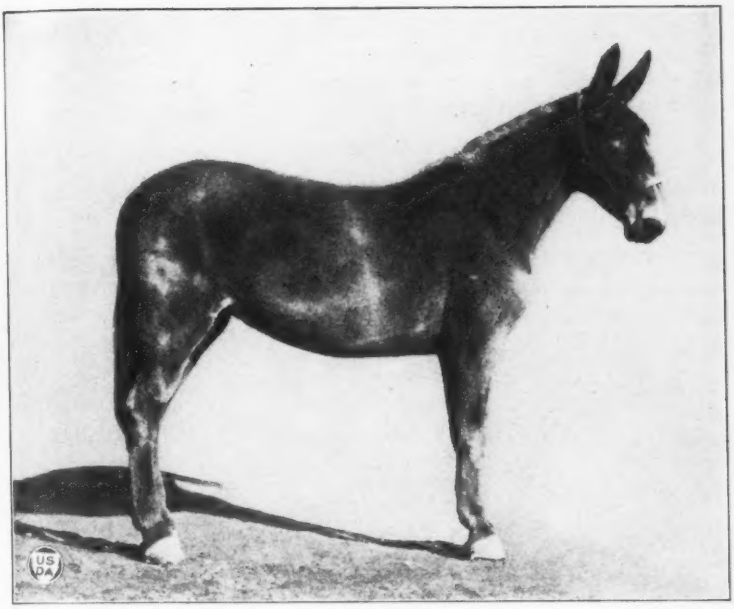


FIGURE 13.—A Medium farm mule.

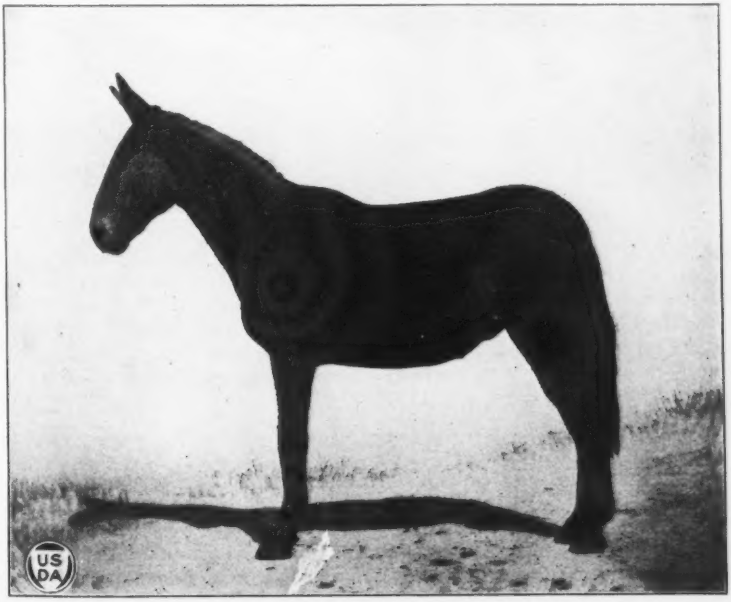


FIGURE 14.—A Common farm mule.

lack finish and condition, as the farmer often likes to buy mules with a prospect of developing them into more valuable animals. Many of them are worked for a season and then fitted for the market, where they are placed in one of the other specific classes, such as "drafters," "sugar mules," or "cotton mules."

SUGAR MULES

Sugar mules are those which are purchased for shipment to the sugar plantations of the South. This class of mules is somewhat

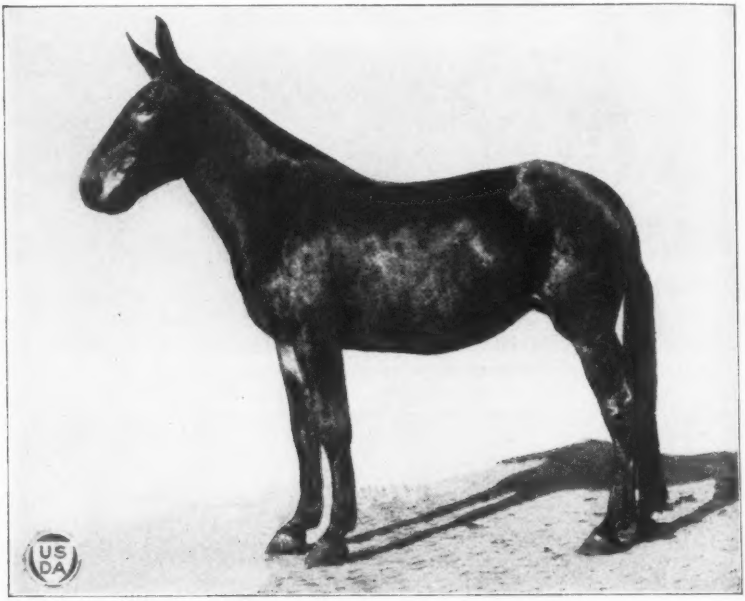


FIGURE 15.—A Choice sugar mule.

rangy in type and should have good quality, style, and finish. The mules in this class are heavier and more compact than cotton mules, but are not so heavy as draft mules. The range in weight is from 1,150 to 1,300 pounds. In selecting sugar mules special attention should be given to quality and adaptability to the work. The feet should be large and well-shaped. Mare mules are preferred for the sugar trade (figs. 15, 16, and 17).

COTTON MULES

As the name implies, cotton mules are purchased for work on cotton plantations. The typical cotton mule (figs. 18, 19, and 20) is somewhat lighter and more angular than the sugar or surface-mining mule but is heavier than the pit mule. While there is a considerable gradation of quality and age in this market class, the planters of the South are becoming more and more inclined to favor increased weight

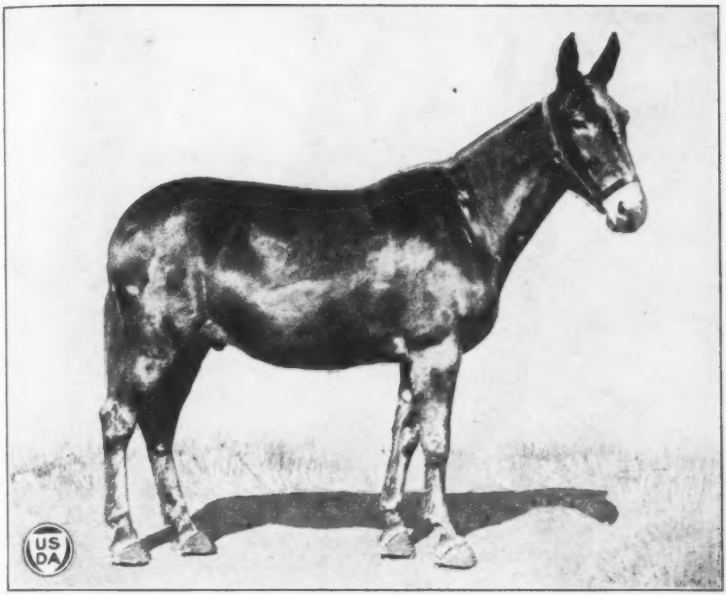


FIGURE 16.—A Good sugar mule.

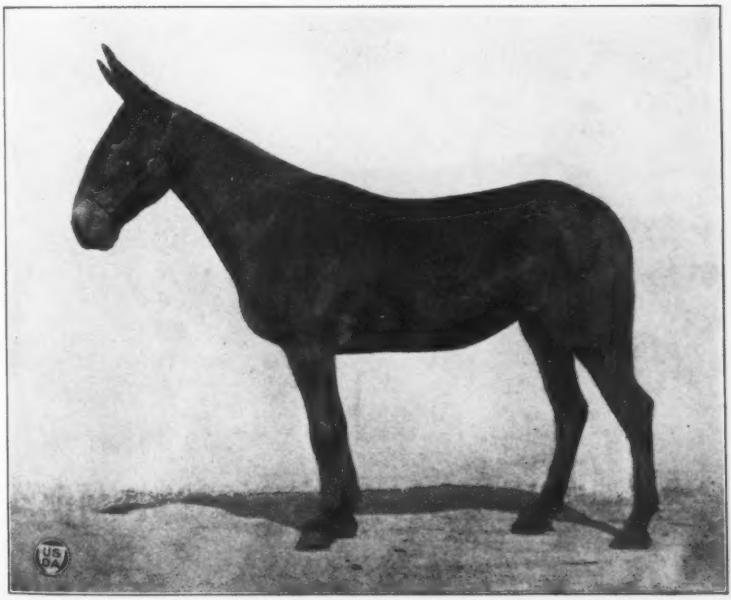


FIGURE 17.—A Common sugar mule.

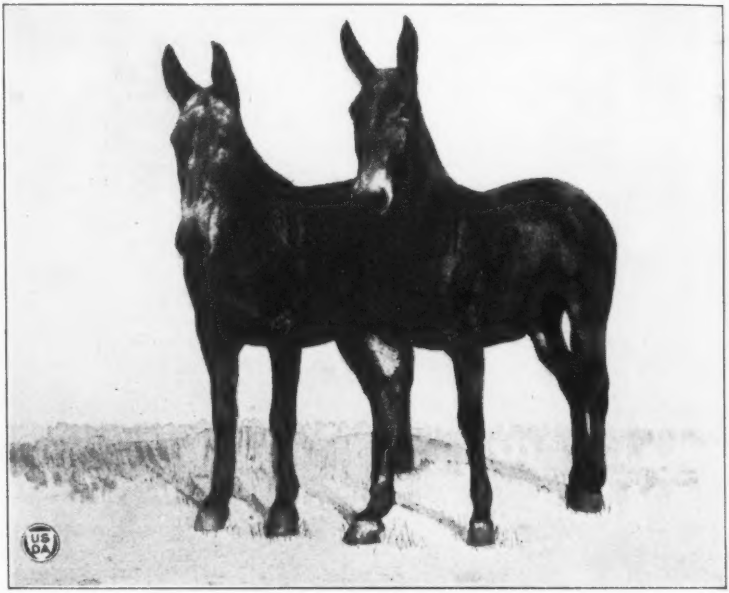


FIGURE 18.—A team of Choice cotton mules.

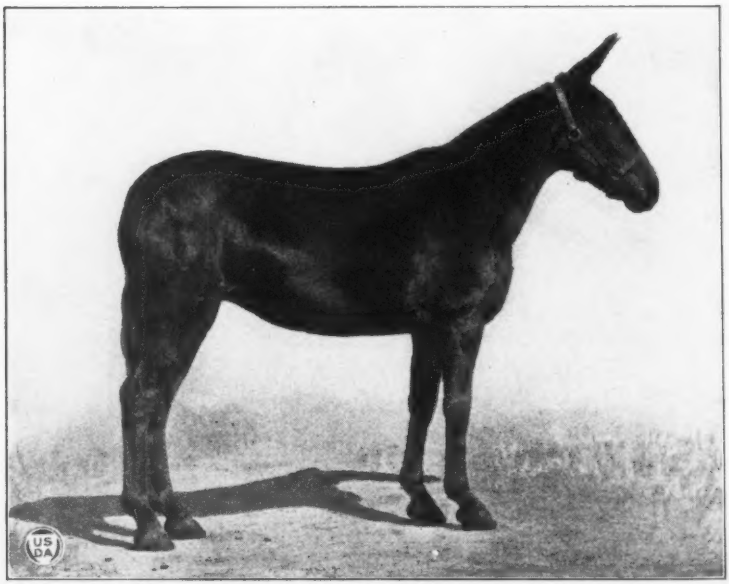


FIGURE 19.—A Good cotton mule.

and quality in their mules than prevailed a few years ago. A Choice cotton mule weighs about 1,150 pounds and is alert and active, but most mules in this class range from 750 to 1,100 pounds. The age limits within this class are variable. Mules from 5 to 7 years old are preferred, however, for this trade and bring the best prices.

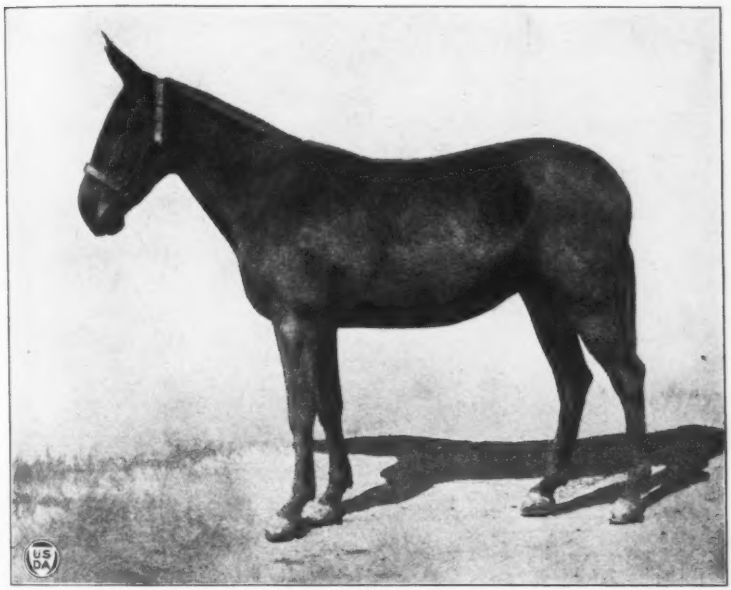


FIGURE 20.—A Medium cotton mule.

MINING MULES

There is a wide range in weight among mining mules, varying from 600-pound pit mules to 1,350-pound surface mules (figs. 21, 22, 23, and 24). Good feet and freedom from blemishes are requirements for mules that qualify for top prices for the mining trade.

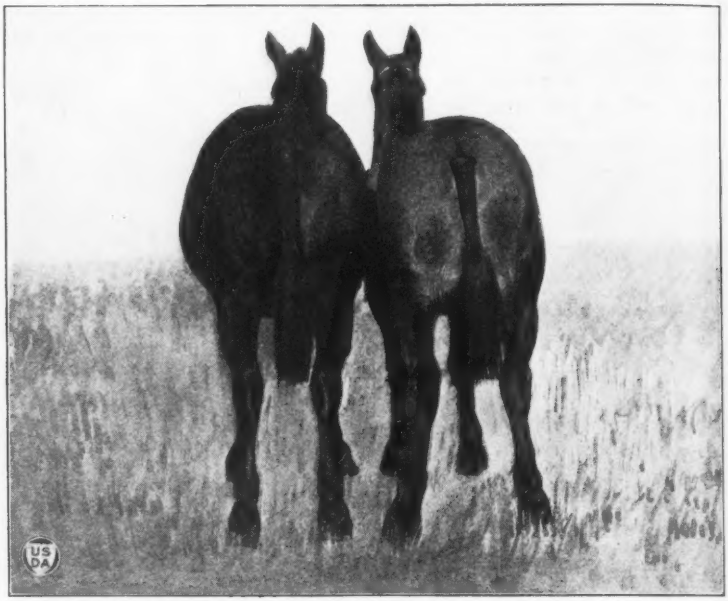


FIGURE 21.—A team of Choice surface mining mules.

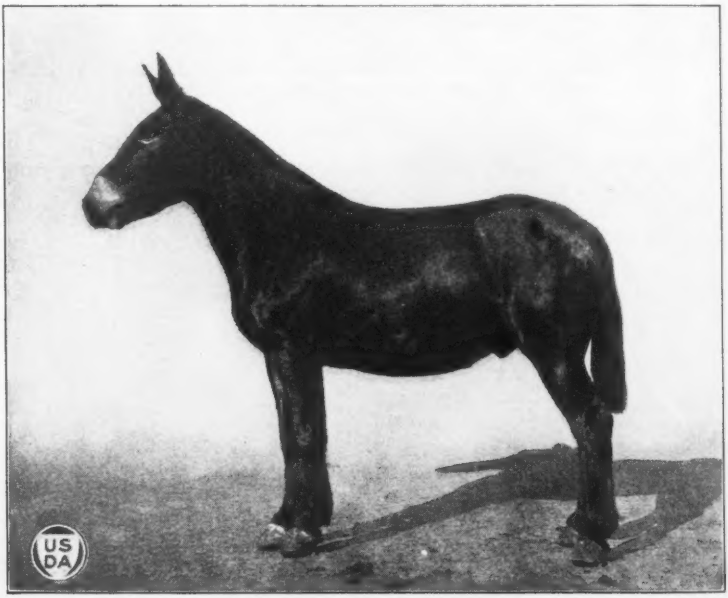


FIGURE 22.—A Choice surface mining mule.

FIGURE 23.—A Choice pit mining mule.

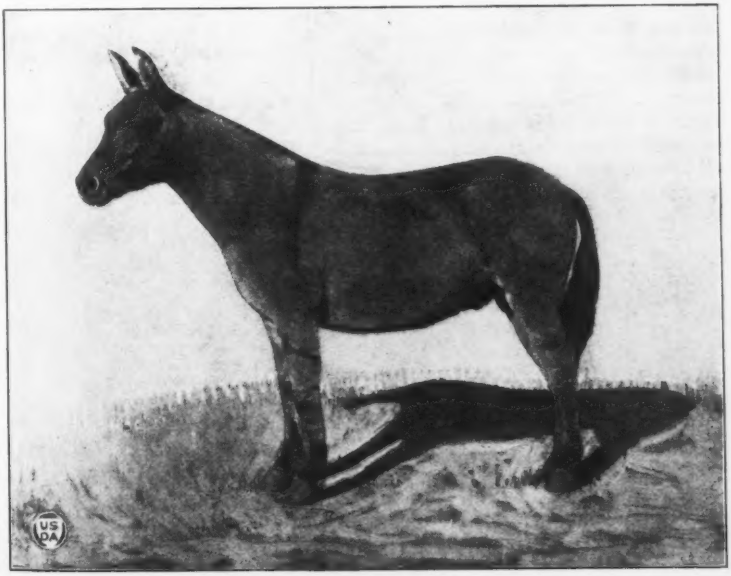


FIGURE 24.—A Good pit mining mule.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE WHEN THIS PUBLICATION WAS LAST PRINTED

Secretary of Agriculture	HENRY A. WALLACE.
Under Secretary	M. L. WILSON.
Assistant Secretary	HARRY L. BROWN.
Director of Extension Work	C. W. WARBURTON.
Director of Finance	W. A. JUMP.
Director of Information	M. S. EISENHOWER.
Director of Personnel	W. W. STOCKBERGER.
Director of Research	JAMES T. JARDINE.
Solicitor	MASTIN G. WHITE.
Agricultural Adjustment Administration	H. R. TOLLEY, *Administrator.*
Bureau of Agricultural Economics	A. G. BLACK, *Chief.*
Bureau of Agricultural Engineering	S. H. MCCROBY, *Chief.*
Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Bureau of Biological Survey	IRA N. GABRIELSON, *Chief.*
Bureau of Chemistry and Soils	HENRY G. KNIGHT, *Chief.*
Commodity Exchange Administration	J. W. T. DUVEL, *Chief.*
Bureau of Dairy Industry	O. E. REED, *Chief.*
Bureau of Entomology and Plant Quarantine	LEE A. STRONG, *Chief.*
Office of Experiment Stations	JAMES T. JARDINE, *Chief.*
Farm Security Administration	W. W. ALEXANDER, *Administrator.*
Food and Drug Administration	WALTER G. CAMPBELL, *Chief.*
Forest Service	FERDINAND A. SILCOX, *Chief.*
Bureau of Home Economics	LOUISE STANLEY, *Chief.*
Library	CLARIBEL R. BARNETT, *Librarian.*
Bureau of Plant Industry	E. C. AUCHTER, *Chief.*
Bureau of Public Roads	THOMAS H. MACDONALD, *Chief.*
Soil Conservation Service	H. H. BENNETT, *Chief.*
Weather Bureau	WILLIS R. GREGG, *Chief.*

U. S. GOVERNMENT PRINTING OFFICE: 1938

For sale by the Superintendent of Documents, Washington, D. C. - - - - Price 5 cents

XUM